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NEW YORK, SATURDAY, JUNE 17, 1905.

CONTENTS.


Editorial ..... 1107
Programme of the Institute Meeting..... 1110
The National-Interstate Telephone Association Meeting at Chicago..... 1110
The Boston Electrical Exposition..... 1110
Independent Telephony in Indiana..... 1110
Denver Convention of National Electric Light Association..... 1111
Pacific Coast Engineering Congress..... 1119
University of Illinois Test Car..... 1120
Missouri Independent Telephone Association..... 1120
Harvard and Massachusetts Technology..... 1120
Trees in Wireless Telegraphy..... 1120
Current News and Notes..... 1120
Electrical Engineers of the Times.—XIV. Prof. Vladimir Karapetoff.. 1122
Electrical Engineering at the Kyoto, Japan, Imperial University..... 1123
External Reactance for Synchronous Converters. By Clarence P. Fowler 1125
Some European High-Tension Switchboards.—II. By Prof. Dr. F. Niethammer. ..... 1127
New Telephone Patents..... 1129
LETTER TO THE EDITORS:
Direct-Current vs. Induction Motors for Machine Drive. By Robert T. Lozier. ..... 1130
Digest of Current Electrical Literature..... 1131
Step-Bearings of Curtis Steam Turbine..... 1136
Large Electrically-Driven Planer..... 1136
Typo-Telegraph ..... 1137
Non-Collapsible Inner Globe..... 1138
Dynamotor for Rontgen Ray Work..... 1139
Automatic Numbering Machine ..... 1139
Electric Light Convention Exhibits..... 1139
Industrial and Commercial News..... 1142
General News of the Week..... 1145


## GETTING ELECTRIC LIGHT BUSINESS.

The Denver-Colorado Springs Convention of the National Electric Light Association will doubtless go down into history as the one marking a great awakening among central station men on the question of new business getting. At previous conventions the matter had received a little attention, it is true, but never before has it taken up so much of the convention programme. This is but fitting when it is considered that the convention sessions were held in Denver, a city where the central station company has without doubt the most elaborate business-getting organization in the country, as described fully in our issue of June 3. Although the discussion at the convention was mainly on the advertising end of the new business department, it was not forgotten that personal solicitation plays an all-important part in connection with advertising in a new business campaign. It is well that so much emphasis was put on advertising at the Denver convention, because it is on this particular point that many electric light men have been entirely too conservative or indifferent in the past decade. It is just as easy, and perhaps easier, to waste money on advertising as it is to waste it on mistakes in engineering and construction. But that does not detract from the value of well-planned advertising, and it is now thoroughly established that electric light and power companies are as likely to find advertising profitable as any other concerns having things to sell.

The Denver Company received many compliments both on and off the convention floor on the great extent of sign, store window and display lighting in that city. It was also complimented on the excellence and effectiveness of the illumination found in many stores and store windows. This brings up a subject which has been entirely too much neglected by central station companies as well as the general public, namely, the effective and efficient use of light delivered so as to obtain the best results for the money expended by the consumer. Nothing helps a business-getting department of a company more than a lot of satisfied customers with premises well lighted at a reasonable expense. The company should not remain indifferent to the inefficient manner in which a customer may install his electric lights from an illuminating engineering standpoint, any more than that it should be indifferent to dangerous conditions of wiring on customer's premises. Either may help give electric light a black eye in a community. The general public knows little of the art of illumination by electric light, which art involves exact information as to the characteristics of different shades and reflectors, as well as knowledge of certain general laws of physics and physiology. Unfortunately, many electric wiring and fixture contractors and architects are not well posted in such matters, either. Next after the customer it is the central station company that is most vitally interested in the results that the customer gets for his money. The customer cannot be dictated to in such matters, but will, in most cases, be glad of advice from the company. Illuminating experts are at present scarce, but the day will come when every large central station will have men who are specialists in this branch and when the subject will be given more attention by the small company managers. When that time comes we shall have installed each year fewer excellent examples of "the misuse of light" and electric lighting will be more popular among all classes. The sentiment was recently expressed by a man prominent in one of the large lamp factories of the country that his company anticipated in

the next few years a greater and more certain advance in lighting efficiency by the equipment of lamps with proper reflectors for the work to be done and by the proper placing of lights with reference to the surfaces to be lighted, than by any increase in efficiency of the sources of light. Certain it is that much of the artificial light now delivered by electric light companies is wasted, and it is only a matter of good engineering to recover it with no uncertainty nor experiment.

## THE VALUE OF STANDARDIZATION.

We have been interested in looking over Mr. Hall's N. E. L. A. paper on this subject. We have no little sympathy with some of his contentions, although in the main we cannot altogether agree with him. In the present state of electrical science it is certainly untrue that a special machine can in any proper sense of the word be called "experimental" unless the departure from the parent type be very great. In fact, the production of a special machine is an opportunity often taken for improving the design or construction, so that as often as not it may be better than the nearest allied standard form. The tendency toward complication in new electrical machinery generally does not exist unless the complication is a manifest improvement, since every designer is striving for all the simplicity compatible with good performance, and to that end utilizes all his experience with designs standard and special. "Standard" machines are not machines which have reached perfection, but merely machines upon which for commercial reasons improvements have ceased. It sometimes even happens that a "standard" machine, having been deftly modified to lower the cost of production, is actually inferior to its "special" prototype. And if one will turn a reflective eye over the history of the art he will find cases where the standard machine of yesterday was the special machine of last week and is to-day obsolete and unsalable in spite of all the efforts of the conservative to keep it standard. Unless the central station man changes equipment merely to be in the fashion, as he might change his automobile, he will always find himself possessed of apparatus which has diminished in market value, although of continued usefulness.

Nor is it true that special machines generally are materially more costly and longer in building than standard ones. Frequently, indeed, they are, but it is not a rare occurrence to find that standard production is jammed so that a special form can be turned out in about the same time and at about the same cost as if it were standard. Everything depends on the nature and amount of the deviations from existing patterns, dies and specifications. On the other hand, there is, as we have often pointed out, a deal of utterly foolish specialization that serves no useful purpose and merely indicates poor judgment and lack of foresight. Particularly do we reprobate the common vice to which Mr. Hall refers, of drawing a specification so that it will be standard for one manufacturer and special for all the rest. It is bad business policy at best, and at worst bad morals. If an engineer really has good reason for wishing a particular machine of a certain manufacturer, he should frankly say so and confine competition to other items. The more latitude allowed in the specifications, the more genuine competition there will be in the bidding. Specialization in inconsequential details should not be encouraged, for it is of little use and makes a disproportionate amount of trouble and expense. If, however, specialization can produce conspicuous advantage, there is no good reason for sacrificing this advantage for the sake of having apparatus already in common use. The art has progressed not through standardization, but in spite of it. After all, the whole question is one of common sense. If a man can buy from stock a shoe that fits him, he has nothing to gain by insisting upon a special last. If he cannot, the sooner he gets a special last the fewer corns he will accumulate. Special designs should, however, be called for only when there is good reason for them, and not, as so often happens, to suit arbitrary standards set up without due foresight. Most special dynamos result from trying to fit them to somebody's "standard" engine or water-wheel.

## LIGHTNING AND LIGHTNING ARRESTERS.

Mr. Dow's convention paper touches a subject that is near to the heart and pocketbook of every central station man. The fundamental difficulty in adequate protection is that the function of arresters is not simple but very complex. They have to protect against real "static" discharges, which are fortunately of little consequence; against resonance in its various forms, including the very formidable ones which are associated with a ground on the system, and finally, against lightning in the form of direct or induced strokes. The first duty of the arresting, or more properly, diverting system is to protect the valuable apparatus in power houses and sub-stations; its second duty is to prevent damage to the lines. Mr. Dow sets forth very clearly the really fundamental requirements, and some of the ways in which they may be met. Perhaps the greatest single difficulty is that met in high-voltage work, where if a path of adequately low resistance be provided for ordinary lightning discharges, the following current may rise to disastrous magnitude. This is really the crux of lightning arrester construction. To deflect a discharge of high virtual frequency like lightning, and also of large instantaneous energy, the path to earth must be of low inductance and resistance, but these conditions are unfavorable as regards control of the line current in case of resonance. If the arresters are set so that the path across the gaps will open for moderate rises of potential, it is likely to open too often; while if greater leeway is allowed, a dangerous rise in potential may occur without causing a discharge. These complex conditions really forbid a general solution of the problem.

It therefore seems to us that lightning protection should be regarded as a special problem in engineering demanding much specialized treatment. Arresters with gaps in part shunted by high resistances have been successfully used to discriminate between ordinary static disturbances on the line and lightning discharges of greatly increased potential. Also water jets and other devices of very high resistance have been used in permanent or temporary connection with the line. These keep the line clear of minor disturbances, but are of too high resistance to take care of very powerful discharges. Of grounded wires strung alongside the lines, and of barbed wire, Mr. Dow has no very high opinion. Experience with such devices has been very various, as might be expected when conditions vary as widely as they do upon transmission systems. In the discussion upon this topic at the St. Louis Congress the general opinion was that the current forms of arrester were of very moderate value and that something better was very badly needed. Oddly enough, some of the very high-voltage systems had experienced little trouble, owing very likely to the fact that the insulation strength had been made so high as to be safe against moderate disturbances which might be disastrous on systems less elaborately insulated. In one matter we must differ somewhat with Mr. Dow. He advocates a very liberal use of arresters upon the lines. This practice is all right so far as diverting discharges goes, but the arresters themselves are sources of danger from the standpoint of continuous operation, and cannot safely be used unless conditions are such as to give them a greater degree of reliability than is usual. It makes small difference to the operator whether the service is shut down by a damaged insulator or a damaged arrester. It, therefore, would be wiser to limit the arresters to such number as can be under proper inspection in times of danger. The whole subject is one upon which more information is very badly needed, and it would be wise for the N. E. L. A. and other technical bodies to arrange for the systematic collection of data on arresters and their practical performance.

## THE CHOICE OF AN INSULATED CABLE.

A paper on this subject was presented at the recent Denver meeting of the National Electric Light Association by Mr. W. S. Clark, who has had long experience with the manufacture of cables in this country. It contains many practical and useful suggestions. Among the substances employed for insulating electric power cables, we have bituminous or asphaltic materials, paper and rubber. The bituminous substances have not thus far shown themselves to be suitable for high-tension service. Paper and rubber have been the actual competitors for the insulation of high-tension cables. Of these, however, good rubber has decidedly the higher dielectric strength, so that for the highest pressures rubber is almost essential. On the other hand, rubber is rapidly becoming a luxury, so that for the lower pressures paper has distinctly the advantage. Mr. Clark points out that within the last few years a new type of insulation has proved itself of value, namely, varnish and cambric. That is essentially a cloth structure supporting multiple films of insulating varnish. Between the varnished cambric tapes are thin layers of plastic insulator. The peculiarity of this form of insulation is that it is heterogeneous. We have successive layers of varnish, cloth and plastic separator. The dielectric strength mainly resides in the layers of varnish. The varnish and cambric insulation is less expensive than rubber, and has also greater durability. On the other hand, it is more flexible than paper and will stand as high a temperature as paper.

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The composite nature of varnish and cambric insulation lends itself well to artificial regulation of dielectric strength. It is well known that in any cable the electric stress tending to rupture the insulator is not constant throughout the wall, but increases inwardly in direct proportion to the curvature of each jacket, or in inverse proportion to the radius. Consequently, the stress on the internal layers is considerably greater than on the external layers. If, for example, the outer diameter of the insulating wall is three times the inner diameter, then the dielectric stress on the innermost layers will be three times greater than that on the outermost layers. The thicker the insulating wall, the worse becomes this disparity. Consequently, it becomes important to put the strongest insulators on the inside, where the stress is greatest, and to put the weakest insulators in the outside layers where the stress is least. Such graded cables are coming into service with distinct advantages of effectiveness and economy. An interior wall of rubber and an outer wall of varnished cambric is much cheaper than an all-wall rubber cable, and is probably also superior in nearly all respects.

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The paper advocates the testing of cables at 150 per cent extra pressure for half an hour at the factory and again at 100 per cent extra pressure for half an hour after being first installed. This is, we believe, sound practice. We agree, moreover, with the author that such tests should not be regarded as "breakdown tests." The purchaser of a crane does not proceed to determine what load will break his machine after it has been put in place. He prefers to apply the maximum load that the machine can ever be called upon to lift, and ascertain that the machine has ample power to carry that load securely. At the same time, we think that it is good practice to cut short lengths from the ends of a cable in manufacture and to ascertain the dielectric breaking stress of these samples by actual trial. If the factor of safety between the lowest fair breaking stress in tests of brief application, and the working pressure intended for the cable, is sufficient, then the factory and installation dielectric tests are merely for the purpose of ascertaining that there are no defects in the insulation, or that the condition of the whole length is up to that of the samples previously selected and destroyed. This is in conformity with the practice in mechanical engineering where test pieces are selected for destruction, while the completed structure is merely tested for safety. Dielectric testing seems destined to conform with mechanical testing in this respect more closely as time goes on and experience accumulates.

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## THE SERIES ALTERNATING-CURRENT MOTOR FOR GENERAL USE.

As we have more than once remarked, it is singular that, with all the announced enthusiasm for the alternating-current railway motor, the similar motor for ordinary stationary purposes lingered so far in the rear. It has every advantage in its favor and should logically have preceded the form specialized for the difficult conditions of railway service. Mr. Renshaw's N. E. L. A. paper puts for the first time the stationary form before the public. On the face of affairs such a motor has very much to recommend it. In the discussion of railway working it has been repeatedly stated that the excellent commutating forms now devised were admirably efficient, closely approximating first-class direct-current motors, had power factors greatly superior to induction motors and had a beautifully simple and efficient speed control. Such qualities as these render motors possessing them of great value to the central station man, especially in dealing with hoisting in its various forms. The induction motor is entirely competent to deal with constant-speed work, at least in case of polyphase circuits, and the addition of the commutating-series motor would seem to fill a long-felt want. To be sure, the single-phase induction motor is hardly up to its polyphase cousin, but with a commutating motor of the splendid qualities reported for the new railway motors this failing would be in great measure compensated, and the single-phase system, which in point of simplicity is ideal, would have a strong hold upon popular favor.

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Now that the stationary, alternating-current, commutating motor is here, we have an opportunity of seeing in how far these roseate predictions are fulfilled. Owing to the fact that Mr. Renshaw does not give the normal rate, save inferentially in a single instance, for any of the motors for which the curves are given, it is a little difficult to make exact comparisons, but upon any reasonable theory as to rating it is perfectly clear that at or near rated load all these motors are not equal to direct-current commutating motors and to polyphase induction motors in efficiency, both real and apparent. The only advantageous feature shown is a good power factor at light loads. The 25-cycle motor rated at 20 hp, which is by far the best of the lot, shows at this point a real efficiency of about 84 per cent and a power factor of about 88, or an apparent efficiency of 74 per cent. This real efficiency is at least 5 per cent short of what a well-designed direct-current motor should do and short of induction motor efficiency by nearly the same amount. In apparent efficiency 74 per cent is a very ordinary figure for good induction motors. A 50-hp, two-phase induction motor by the same manufacturers shows 89 per cent real efficiency and 92 per cent power factor at its rating. The other commutating motor curves are not equal to that just mentioned. At reduced speed the power factor falls rapidly and the efficiency is considerably reduced even without allowing for rheostat losses, so that on the whole the results at varying speeds would certainly be no better than those from a properly designed induction motor with a rheostat in its secondary circuit, to say nothing of the inconvenience of working one's severest loads single-phase upon a polyphase distribution. The most useful feature of these motors seems to be good apparent efficiency at moderate loads, an important property under certain conditions. The new motors appear to be thoroughly workmanlike in their construction and will undoubtedly prove useful adjuncts to existing apparatus, especially on single-phase systems, where the need for them is really most acute.

## Programme of the Institute Meeting.

Details of the meeting of the American Institute of Electrical Engineers, next week, at Asheville, N. C., have already been given in these pages. We are now able to furnish the programme as arranged day by day. The meetings will be held in the convention hall in the Battery Park Hotel.

Monday, June 19, 9.30 to 1.—(1) Address of welcome, by Hon. A. S. Barnard, Mayor of Asheville. (2) Address, President John W. Lieb, Jr. (3) "High-Potential Oscillations of High Power in Large Power Distribution Systems," by Charles P. Steinmetz. (4) "The Constant-Current Mercury Arc Rectifier," by Charles P. Steinmetz. (5) "An Experimental Study on Commercial Transmission Lines of the Rise of Potential Due to Static Disturbances, Such as Switches, Grounding, etc.," by Percy H. Thomas. Afternoon—Drive through Mr. George W. Vanderbilt's estate at Biltmore. Evening—(6) "Data Relating to Electric Conductors and Cables," by Henry W. Fisher. (7) "Methods of High-Pressure Measurement," by S. M. Kintner. (8) "Some Comments on Remarks Made by Col. R. E. B. Crompton Before the International Electrical Congress at St. Louis," by John W. Howell.

Tuesday, June 20, Railroad Day, 9.30 to 1.—(9) "Three-Phase Traction," by F. N. Waterman. (10) "Heavy Electric Freight Traction," by C. de Muralt. (11) "Choice of Motors in Steam and Electric Practice," by William McClellan. (12) "Electrical Features of Block Signaling," by L. H. Thullen. (13) "Weight Distribution on Electric Locomotives as Affected by Motor Suspension and Draw-Bar Pull," by S. T. Dodd. Afternoon—Visit to the Weaver Power Company's high-tension transmission plant. Evening—Ball in the main ballroom at the Battery Park Hotel, as arranged by the local committee.

Wednesday, June 21, Electrical Design Day, 9.30 to 1.—(14) "Limits of Injurious Sparking in Direct-Current Commutation," by Thorburn Reid. (15) "A Study in the Design of Induction Motors," by C. A. Adams. (16) "Limitations in Direct-Current Machine Design," by Sebastian Senstius. (17) "Motor-Generators and Synchronous Converters," by W. L. Waters. (18) "A New Instrument for Measuring Alternating Currents," by E. F. Northrup. (19) "Eddy Currents in Large Slot-wound Conductors," by A. B. Field. Afternoon—Trolley excursion through Asheville and vicinity. Tea at the Swannanoa Golf Club. Evening—Banquet at the Battery Park Hotel, as arranged by the local committee.

Thursday, June 22, New Development Day, 9.30 to 1.—(20) "Water-Power of the Southeastern Appalachian Region," by F. A. C. Perrine, member, consulting engineer, New York. (21) "The Development of the Ontario Power Company," by P. N. Nunn. (22) "A New Carbon Filament," by John W. Howell. (23) "A New Induction Generator," by William Stanley. (24) "Note on a Simple Device for Finding the Slip of an Induction Motor," by Charles A. Perkins. (25) "The Preservation of the Southern Streams; a Forest Problem," by Charles E. Waddell. Afternoon—Organ recital at All Souls' Church, Biltmore. Evening—Smoker at Albemarle Club.

Friday, June 23.—Programme to be arranged by the local committee. Visiting members will be given the privileges of the Swannanoa Golf Club and of the tennis courts at the Battery Park Hotel.

The transportation arrangements, hotel accommodations, etc., are all set forth in the special notices and postal cards issued to members by Secretary Pope. There is already promise of an attendance of from 200 to 250, including many from the South.

## The National-Interstate Telephone Association Meeting at Chicago.

The convention of the National-Interstate Telephone Association will meet at 10 A. M., June 20, at the Auditorium Hotel, Chicago. The committee of the National Independent Telephone Association of America will meet at the same place just before the general meeting to hear the report of the committee on the question of consolidation with the Interstate Independent Telephone Association of America. It is expected that the report will be ratified and the consolidated associations will meet at the time appointed.

At least 15 states will be represented at the convention, and it is estimated that there will be an attendance of not less than 500. There will be two sessions each day, the morning session being called at 10 o'clock and the afternoon session at 2.30. Addresses will be delivered by Mr. James B. Hoge, of Cleveland, on "The National-Interstate Telephone Association," and Theodore Gary, of Macon, Mo., on "Ways and Means to Make Our Association a Success." Four committees of twelve members each, from all parts of the country, will be appointed on the following-named subjects: Standard Operating Rules and Regulations; Standard Forms of Accounting; Standardization of Equipment; Best Methods of Advertising. Papers will be read as follows: "Shall Independent Telephone Companies Have an Insurance Company of Their Own?" by James E. Bailey, of Toledo, Ohio; "Standard Toll Signs," by L. L. C. Brooks, St. Paul, Minn.; "What Arrangement Is Necessary Between Operators and Manufacturers to Protect Independent Companies?" by Thomas Bromley, Muncie, Ind.; response to the foregoing by a member of the Manufacturers' Committee; "Combined Telephone and Telegraphy," by Samuel G. McMeen, of Chicago. "Telephone Securities" will also be considered and other topics will be discussed. The convention, as already announced, will cover three days, June 20, 21 and 22, the last day being devoted to the inspection of exhibits and to entertainment. A banquet will be held on the evening of June 22. Mr. P. C. Burns, of Chicago, is the chairman of the entertainment committee, and a very profitable meeting is predicted.

## The Boston Electrical Exposition.

Mr. Chester I. Campbell, manager of the coming International Electrical Exposition, to be held in Mechanics Building, Boston, July 15 to 22, announces that the exposition gives every promise of being highly successful. The exposition is held in connection with the Fifth Annual Convention of the National Association of Electrical Contractors, to which already 39 States have arranged to send delegates. It is stated that the exhibits will occupy the entire building, comprising 83,000 sq. ft. of floor space, and that they will cover the widest possible range in electrical arts and sciences. The number of working electrical exhibits will, it is said, far exceed those of any previous similar exposition, while the presence of several inventors of celebrity has been assured, some of whom will personally demonstrate their devices. It is intended to have the decorations on a scale more elaborate than anything yet seen in the East and many exhibitors will add to the brilliancy of the scene by elaborate electrical effects. Reeves' American Band has been engaged for the entire exposition. One day of the convention will be devoted to an open session, when the electrical trade will be invited to be present and participate in the proceedings.

The National Association of Electrical Contractors, during the Fifth Annual Convention of which the exposition will be held, has a membership of 659, covering every section of the country, and is one of the powerful trade organizations of the United States. The committee in charge will invite as their guests during the exposition leading architects, electrical and mechanical engineers, insurance inspectors, electric lighting and street railway companies of the country. The address of the manager, Mr. Chester I. Campbell, is 5 Park Square, Boston, Mass.

## Independent Telephony in Indiana.

A well-attended meeting of independent telephone men was held in Fort Wayne, Ind., June 2, the principal subject discussed being "toll line contracts." Hon. Robert S. Taylor, telephone attorney, who was present, expressed the opinion that the toll line contracts between the independent companies and the United Telephone Company prior to the sale of the latter company to the Bell interests, are binding alike on both parties. The independent managers, says a correspondent, do not deny that they are seeking a loophole by which they may shut out the Bell Company of its connections with independent lines recently acquired by reason of the sale of the United Company. They say they do not expect anything more than a mere perfunctory compliance or carrying out of the contracts by the Central Union, and if they were rid of the contracts and connections they could more easily invade the territory now covered by the United Company.

# Denver Convention of National Electric Light Association.

IN the ELECTRICAL WORLD AND ENGINEER of last week a long telegraphic dispatch described the preliminaries connected with the convention of the National Electric Light Association in Denver, as well as the incidents connected with the opening of the Convention, and a running account of the discussions. Abstracts were also given of all of the papers then available. We now give below an editorial account of the Convention as a whole, embracing the discussions of the various papers and reports, and elsewhere in this issue will be found a number of convention notes, descriptive of events connected with the affair, and of the features of the occasion. A large amount of space is also devoted this week to a description of all exhibits, and a list is also furnished of all the representatives connected with the electric lighting companies in membership and attending the Convention. Nearly a hundred and fifty companies were thus represented, from all parts of the country. The attendance from the section west of the Mississippi was remarkably large.

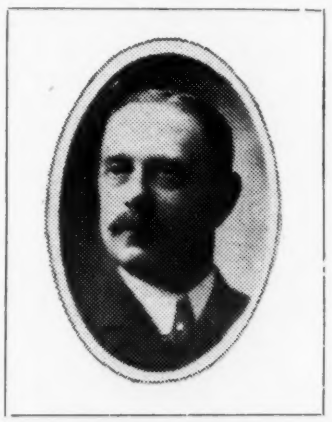
The report of the secretary-treasurer showed that during the past year the total of all expenses was $17,009, and the balance now on hand, $6,356.89.

Following are the officers elected for the ensuing year: President, Mr. W. H. Blood, Jr., Seattle, Wash.; first vice-president, Mr. Arthur Williams, New York; second vice-president, Mr. Dudley Ferrand, Newark, N. J. The following gentlemen were elected members of the Executive Committee, to serve three years: Mr. Charles L. Edgar, Boston; Mr. John Martin, San Francisco; Mr. Frank W. Frueauff, Denver. Mr. L. A. Ferguson, chairman of the Nominating Committee, stated that formerly the secretary-treasurer was appointed by the Executive Committee, but as this officer is no longer a salaried employee, he suggested that it would be a complimentary action for the Convention to elect him. Acting upon the suggestion, Mr. W. C. L. Eglin, of Philadelphia, was elected secretary-treasurer.

At the meeting of the Executive Committee on the final day of the meeting the following business was transacted: Report of the Committee on Relations with Kindred Organizations, by Mr. James I. Ayer, of Boston, chairman; report of Preliminary Draft of Committee on Rates and Costs, Charles L. Edgar, Boston, chairman; report of the Committee on Municipal Ownership, Mr. Arthur Williams, New York, chairman; report of the Committee on Standard Rules for Electrical Construction and Operation, Mr. Charles L. Edgar, chairman, Boston.

### PRESIDENT W. H. BLOOD, JR.

Mr. W. H. Blood, Jr., the new president of the National Electric Light Association, is one of the prominent men in the Stone & Webster organization. At the present time he is connected with the



PRESIDENT W. H. BLOOD, JR.

Seattle Electric Company in both an engineering and business capacity. Most of his time is spent in Seattle, although he makes frequent extended trips to Stone & Webster headquarters in Boston. He has been connected with this firm for eight years past and has taken a prominent part in the management of its electric lighting and railway properties in a number of cities, including Savannah, Ga.; Tampa, Fla.; Terre Haute, Ind.; Lowell, Mass., and Brockton, Mass.

Mr. Blood is 39 years of age and a native of Boston. He took a four-years' course at the Massachusetts Institute of Technology and in 1888 went into the Thomson-Houston works at Lynn, soon being given charge of the second floor of factory C, which did the assembling and testing of alternating-current machinery. In 1890 he went to St. Paul with the Northwest Thomson-Houston Company. A year later he engaged in business for himself as one of the partners in the Franklin Electric Company, of Kansas City, which did an electrical contracting business, building about 30 electric light plants and several electric railways and water works. He left this business to go with Stone & Webster in 1897. His work with them has been largely examinations and reports on properties and the making and carrying out of plans for improvement and the elimination of difficulties.

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The convention was called to order at 10.30 on Tuesday morning, June 6, by President E. H. Davis, who introduced the Hon. Robert W. Speer, Mayor of Denver. In his address of welcome Mayor Speer spoke in enthusiastic terms of Denver and Colorado, of the industries of the State, of its splendid agricultural products, its unexcelled climate, etc. After thanking Mayor Speer, on behalf of the Association, President Davis delivered his address.

### ADDRESS OF PRESIDENT DAVIS.

The address of President E. H. Davis was unusually pertinent, due, no doubt, to the fact that as secretary, he had acquired a close intimacy with many of the questions and problems that affect the growth and welfare of the body. It was an admirable document, worthy of citation in full, but the exigencies of space compel the selection of merely the leading passages and recommendations. With regard to adverse legislation, Mr. Davis said:

"The one great and constant menace to the industry is unwise, burdensome, and restrictive legislation, by the municipality and the State. The right to tax is the power to destroy. The power to regulate contains the germ of the danger of confiscation, in whole or in part. The regulation of the industry by a commission with powers such as are vested in the Gas and Electric Commission of the State of Massachusetts, may be proper and satisfactory as safe-guarding both the rights of the public and of the investor. But regulation by a commission brought into being by a manufactured public sentiment, and having its inception in politics, and not primarily or honestly intended to remedy any admitted public oppression, or to properly regulate the use of public franchises, cannot be fair either to the public or to the investor, and must result in gross injustice to the industry. The Association should not be passive while laws placing the industry under the regulation of commissions are passed by the several States without making proper suggestions, whereby such laws would be made reasonable and uniform in their provisions. Nor should it permit, without protest, the passage of any laws admittedly unduly restrictive and burdensome. The object should be to have the general laws of the several States relating to the industry conform to some standard, fair both to the public and to the industry.

"For one State to grant only very limited term franchises under burdensome restrictions, and for another—and possibly an adjoining State—to grant perpetual franchises without restrictions; for one State to reserve the right to fix and change the rate of charge for service rendered, and for another State to empower any municipality to make any rate it may see fit, and to charge the same when and as it pleases, cannot but injuriously affect the stability of the industry from the standpoint of the investing public.

"The Association should, therefore, prepare for the time when it will become a political fad to legislate apparently for the benefit of the public and at the expense of the investor. I would, therefore, recommend the appointment of a standing committee on legislation to aid in protecting the interests of our members, should occasion arise."

Mr. Davis favored State Associations for protective work. He noted approvingly also the proposal of the Association of Licensed Manufacturers of Incandescent Lamps to appropriate the sum of $10,000 for the purpose of co-operating effectively with central stations in increasing by advertising and soliciting methods the sale of lamps and current."

As to membership, he said: "The amendments to the by-laws, adopted at the last Convention, relating to various classes of members, have resulted in a satisfactory addition to our membership. Members, Class B, are officers or employes of member companies, and now number 111; members, Class C, are instructors and teachers of engineering and related sciences, and now number 39, and associate members, Class E, are officers or employees of associate member companies, and now number 68. The total membership is now 823, as compared with 588 a year ago."

Mr. Davis suggested the creation of library and archive facilities, tending to make the Association offices more and more a bureau of information for the members. He also recommended the appointment of a committee to report on the proper method of grounding secondaries, and the continuance of the committee on steam turbines. One notable point was this: "While not strictly within the objects of the Association, it would be well for our members to consider the advisability of consolidating the street railways, gas and electric companies in any given locality, as not only would the public be better served, but the total investment would be more stable, and the results equally satisfactory."

Mr. L. A. Ferguson, chairman of the committee appointed to report on the President's address, submitted the action of the committee at the final session of the Convention. The recommendation as to the appointment of a standing committee on legislation was endorsed, and it was recommended that this very important matter be given immediate and fullest consideration by the Executive Committee. The suggestion for the encouragement of State and sectional organizations and co-operation with the proposed committee of legislation with those bodies was heartily approved. The report especially called the attention of the incoming president to the value of continuing the policy followed during the administration just closed in calling frequent meetings of the executive committee, so that the president may at all times be fully in touch with the needs of the member companies, and at the same time on all occasions have the benefit of the judgment of the members of the executive committee. Following the submittal of the report a resolution was adopted authorizing the expenditure during the coming year of a sum not to exceed $500 for such electrical tests as are thought advisable, the same to be made in a competent testing laboratory.

The presidential address was referred to a committee consisting of Messrs. L. A. Ferguson, F. W. Frueauff, George R. Stetson, Samuel Scovill and S. T. Carnes. Mr. T. C. Martin then presented the report of the Committee on Progress, an abstract of which appeared in our issue of last week. After reading his report Mr. Martin presented the paper of Dr. Louis Bell on the tantalum lamp.

### REPORT ON PROGRESS.

The discussion of the report on progress was taken up at the afternoon session. Mr. Arthur Williams, in referring to mercury vapor lamps, stated that these are used to a very great extent in the commercial lighting of one of the largest buildings in New York and the men who work in this building and in other buildings say that after two or three days they would not willingly work under any other form of artificial light. He considered that the use of electric power for refrigeration was a very important subject for the central station manager, since a refrigerating load comes on in the summer and can be excluded from the peak hours of the four heavy months of the year. Mr. Williams said that the great development in electric sign lighting is very encouraging and that electric light in one form or another is coming to be recognized all over the country as a great advertising medium.

Mr. Alex Dow, referring to the salt works of his company, said that the works are not growing, the reasons being not electrical or mechanical, but purely financial. At the Detroit plant, which has been in operation since last August, exhaust steam is delivered to the salt block, but in the present exceedingly peculiar condition of the salt market it was found advisable to stop drilling salt wells and wait until the salt business became less of a speculative and more of a legitimate business enterprise. He considered that there are a number of electrochemical and electrometallurgical processes not necessarily continuous which can be run profitably and economically at hours away from the peak load. Charging storage batteries he mentioned as an example. Referring to the Detroit Delray plant, he said that the decision to use 4,600 volts was taken because it seemed to be the best compromise voltage for such an area as was to be covered; 2,200 volts was too low and 6,600 volts gets unmanageable when individual transformers must be used, and is, moreover, so high that the municipal regulations of Detroit do not allow its use on pole lines. In addition, the Underwriters' rules require an extra high installation for anything above 5,000 volts. It was thought best to interpose transformers between the 4,400-volt tie line system and the 2,200-volt lines because experience had shown that if a 2,200-volt system going through residence districts filled with shade trees and into corners and back alleys were direct-connected with a 4,400-volt system with 9,000 to 12,000 kw of dynamo capacity on the bus-bars, some complicated situations were apt to arise in stormy weather. The 4,600-volt proposition is troublesome at the lightning arresters,b ut special fuses can be had. On the large motors installed in the sub-stations, and to some extent on 100-hp motors and larger installed on customers' premises, the direct line pressure of 4,400 volts is entirely satisfactory. This refers to motors with a standard armature winding and revolving field.

Referring to steam heating, Mr. Dow said that at present his company receives from a steam heating station continuously during business hours 225 kw with 450 kw on the peak, for which they pay the heating company 2¼ cents per kw-hour during winter months, and as the heating comes during the peak loads this is considered an exceedingly satisfactory price. In another station the exhaust steam from what will be 1,300 kw in engines is sold to a steam heating company for distribution, the rate being so much per 1,000 cu. ft. condensation shown by the meter readings. In the third station, with which the company has no financial connection and now being built, a steam heating company will install two direct-current turbines of the new homopolar type, and will deliver current to the Edison three-wire system. The total investment made by the steam heating company is about $45 per kw. The peak load of the steam heating system is strongly marked, in the residence districts, being from 6.45 to 7.15 in the morning, at which time the peak is very sharp. In the business district the peak comes on somewhat later. In the afternoon toward dusk, when business houses are getting ready to close, the heat is not required and the boilers will be available to run the turbines, which will be run with partial vacuum. The conditions are such that to install the apparatus for the high vacuum generally called for by the steam turbine would not be profitable, but low vacuum can be obtained and the turbines designed to give a ready output non-condensing. The total investment of steam heating mains in Detroit at present, including the plans not yet completed, is close to half a million dollars and will go somewhat above that when all work is done. While it is not yet demonstrated to be a financial success, experience indicates that with further development it will pay. It is felt that the direct supply of steam heat throughout the system downtown will enable the company to get the business of isolated plants. Of these there are less in Detroit than in any city of its size in the country, a system having long ago been adopted in dealing with such plants which resulted in stopping their increase.

In reply to a question Mr. Dow said that the downtown heating plant now in service covers an area of about one-half mile square and that the one coming into service will cover an area of about one-half mile by three-fourths of a mile. There is no definite ratio between the demand for steam heating and the demand for electricity in the same district, though occasionally, as in the case of a factory with a large amount of power, the exhaust steam and electricity demand will match. In the residence districts it means four residences taking electric light to one taking steam heat, and it is readily seen that one must cover a great deal larger area with electric mains than with steam mains. Mr. Dow referred to the distribution of power current direct to factories from 4,600-volt, three-phase circuits, which business is progressing. He had just received advice of the signing of a contract for 24-hour service by a large factory which will mean a minimum bill of $27,000 per annum, the manufacturer shutting down a very effective plant for the purpose of taking this current. Any one wishing to buy 4,600-volt, three-phase current at the bus-bars, regulated to between 4,400 and 4,700 volts, can obtain it somewhat under 1 cent per kw-hour for 24 hours, or 1.2 cents for 12 hours. A railway contract under a differential rate brings in 1.2 cents for direct current, the load being on for 18 hours per day. The present rate for secondary alternating-current supply for 10 hours a day and $3,000 a year gets down to 2.5 cents per kw-hour, under the

condition of minimum investment indicated by the fact that the investment is largely in overhead lines and the only transmission apparatus consists of rotaries. For shorter hour service the rates are proportionately higher. Since the original Detroit plans were laid out involving the covering of an area of 30 square miles, the matter has come up of taking over three different transmission lines, one of which is 14 miles in length and already in operation. Of the other two one is under contract and the other is being considered. One of these will deliver 3,000 kw at 4,400 volts. Within a few months the company will have a considerable transmission system at 22,000 volts, partly underground and partly overhead.

### THE TANTALUM LAMP.

In the discussion of Dr. Bell's paper, Mr. Arthur Williams, of New York, stated that his company had a number of these lamps on test and they promised a very marked improvement in the economy of incandescent lamps in the future. He believed, however, that if the price of the lamp remained at its present figure, $1 in Germany and perhaps $1.50 or $2 here, it would not be a serious competitor with the incandescent lamp; and as there probably have not been more than 100 of these lamps in this country and have not been here long enough to be subjected to any commercial test, he did not think it would be practicable to discuss the lamp in any commercial sense. The high lamp cost will minimize it as a factor in competition with the carbon filament lamp.

Mr. John F. Gilchrist, of Chicago, considered that the new lamp raised the question of selling electricity for illuminating purposes on the lamp-hour instead of kw-hour basis. The new lamp would cut down the income of the station, and while it is unwise to attack anything which has merit, the station manager may want to hold it back until he can build up his business to meet it and not impair the income. He suggested that the Association and electric light men should guide legislation along the lines of charging on the flat hour basis so that a new lamp of the tantalum type could be used by central station men with advantage to themselves. Mr. A. C. Dunham, of Hartford, Conn., said that he had experimented with the tantalum lamp and found that the figures given in Dr. Bell's paper are practically correct. They will burn a long time after a filament breaks, the filament mending itself. He referred to the system brought into vogue by the osmium lamp, where central stations are charged 20 cents per lamp per month rental, the manufacturers supplying repaired or new lamps for lamps burned out. Mr. Dudley Farrand said that his station had two of the tantalum lamps. One showed a consumption of 1.99 watts, but lasted only 20 odd hours. The second lamp is still burning and has shown a consumption of 1.68 watts. Mr. Farrand did not think that the tantalum lamp would work against the interest of the central station at all. Every time the efficiency of a lamp is doubled the capacity of the plant is doubled, and while the higher efficiency may tend to increase the distribution expense, the net result will all be in favor of the high efficiency lamp. He expressed himself as highly in favor of the tantalum lamp and only wished he could get them in sufficient quantities to supply his business to-day. He did not consider it would upset the commercial status as the business would increase with the introduction of the lamp faster than the lamps could be put into use. Mr. W. H. Gardiner, of Boston, thought that the new lamp would enable the candle-power of lamps to be increased to compare with that of gas or to about 25 cp as a unit. He welcomed the opportunity to increase the candle-power rating and pointed out that a similar increase had worked well for gas companies upon the general introduction of the mantle gas burner.

Mr. David Hall, of Cincinnati, then read his paper entitled "The Paramount Importance of the Selection of Standard in Preference to Special Machinery," an abstract of which appeared in these columns last week. Mr. E. F. McCabe, of Lewiston, Pa., suggested the desirability of manufacturers getting together and standardizing electrical machinery. He related an instance where he had received bids from three or four manufacturers, each one being on a different kind of machine; and recently he had asked for bids from a half dozen manufacturers for a 300-kw induction motor with a speed of 350 r.p.m., and not one could produce the same within ten weeks because they said it was special. Mr. H. T. Hartman, of Philadelphia, suggested that electrical manufacturers should standardize their speeds. Mr. C. E. Skinner, of Pittsburg, Pa., presented his paper entitled "Installation Testing—Apparatus and Methods," an abstract of which was printed in these columns last week. The meeting then adjourned until the afternoon session.

The session of Tuesday afternoon was called to order at 2.30 and Mr. Paul MacGahan, of Pittsburg, presented his paper on "Automatic Synchronizing of Generators and Rotaries," an abstract of which will be found in our issue of last week. This paper was followed by that of Mr. Louis E. Bogan, of Cincinnati, entitled "Notes on Rotary Converters and Motor-Generators for Lighting and Power Systems."

### ROTARY CONVERTERS AND MOTOR-GENERATORS.

In discussing the means for the conversion of alternating into direct current, Mr. Bogen stated that in this country at the present time only the rotary converter and the motor-generator are extensively employed, although the vapor rectifier possesses admirable qualities for this purpose. The disadvantage with the 25-cycle rotary resides in the low speed at which it must be run for low voltages in order to have a commutator of reasonable size. The design of the 60-cycle rotary is limited to such a narrow choice of dimension as to be almost fixed, and it is better adapted to lower than to higher voltages. In response to a demand for something better than the 60-cycle rotary, there has been used in Europe a special form of double machine, composed of an induction motor to the secondary of which the collector rings of a direct-driven rotary converter are connected. The frequency applied to the induction motor is 60 cycles, so that if the motor revolves at one-half synchronous speed, 30-cycle e.m.f. will be impressed upon the converter proper. The paper described the various methods of starting rotary converters, and called attention to the necessity of properly adjusting the field strength to eliminate wattless currents, and mentions the use of reactance for assisting, in parallel operation and for preventing hunting. The commercial forms of motor-generator sets were stated to be (1), the combination of an induction motor and a direct-current generator; (2), a synchronous machine and a direct-current machine, and (3), two alternating-current machines coupled together for the purpose of changing the frequency in a system. For small motor-generators, the induction motor-driven set has numerous characteristics in its favor, but for larger sets, the combination of a synchronous machine and a direct-current machine has a great many points in its favor in spite of the necessary auxiliaries. In operating a frequency changer in parallel with either another frequency changer or with a generator on the high-cycle end, there is but one way to connect the high-cycle end in parallel with the other unit. If the other unit happens to be of the same capacity and characteristics, the excitation of the generator end of the frequency changer must be the same as that of the unit with which it is to be brought in parallel, because after it is connected in parallel, a change in the excitation of either the motor or the generator will produce nothing but an interchange of wattless currents between the sets.

In the discussion of the paper by Mr. Bogan Mr. Clarence Renshaw, of Pittsburg, said that while it is difficult to design 60-cycle rotaries for high voltages, yet by proper skill such machines can be designed which operate entirely satisfactorily for direct-current voltages of 500 or even 600. He pointed out the very important advantage which the rotary possesses through its effect on line regulation. By proper adjustment a converter can be made to send a lagging current on the line or a leading current. If induction motor-generator sets were used for operating railway load, a heavy draft of current would affect the voltage on the entire system, and when the cars let go the voltage of the system would rise. Rotary converters give a leading current on heavy load which tends to counteract the drop on the system, and when the cars let go the rotary gives a lagging current which tends to keep down the sudden jump of voltage which would otherwise occur. A motor-generator set driven by a synchronous motor would have the same effect. Mr. Alex Dow, of Detroit, contended that a distinction should be made between the apparatus discussed, as employed for railway or lighting service. In railway service it is possible to compound the rotary with the line to get the excellent results pointed out, but in lighting service, in which variations of voltage that are normal in railway work cannot be tolerated, the conditions differ. Transformers for the rotary must be supplemented by regulating devices to give the necessary range of voltage control. In some recent stations the rotary equipment is both more complicated and more expensive than the motor-generator equipment. For lighting service the motor-generator under American conditions has very many advantages, while for railway service the rotary, even if it be the 60-cycle rotary, justifies its existence completely.

The next paper read was that by Mr. W. F. Hancock entitled "The Organization of Working Forces in Large Power Plants," an abstract of which was printed last week. Mr. W. B. Jackson, of Madison, Wis., spoke of the desirability of keeping a plant in a clean condition, not only owing to the effect in inspiring confidence in customers with respect to reliability, but also for the good effect on the morale of the employes. He said that when one goes into a dirty plant he sees slovenly employes, while when he enters a beautiful, clean plant he sees bright, attractive employes who appear pleased with their work. In reply to a question Mr. Hancock stated that his plant paid firemen $16 a week if they were good men, and if not they did not want them. Operators are taken in at as low as $10 a week and moved up as fast as practicable. He said he did not have a union man on his pay-roll for the reason that a scale of wages higher than that of a union was paid. He believed his men were far above the average of the union men of to-day. For example, firemen get $16, whereas the union scale in Boston is $14 a week, and when delegates of the union call and are told that a higher scale of wages is being paid, they have nothing to say. The men are kept from becoming union men through being paid more wages than they could get as union men. Mr. A. C. Dunham, of Hartford, stated that during the last three years his men have been given an annual dividend of 6 per cent, and that there had not been any opening for a union man since this practice was commenced.

Mr. W. C. L. Eglin, of Philadelphia, then presented his report on the steam turbine, an abstract of which appeared last week, after which the meeting adjourned until Wednesday morning.

At the meeting on Wednesday morning the first paper to be presented was that of Mr. Clarence Renshaw on "Series Alternating-Current Motors for Industrial Work," an abstract of which was printed last week. This was followed by the paper of Mr. G. Percy Cole, of St. Louis, entitled "A New Type of Single-Phase, Alternating-Current Motor for Elevator Work," also printed in abstract last week. These two papers were discussed together.

Mr. Alex Dow said that up to the present the companies regularly installing elevator work, when asked for an alternating-current motor evaded the subject. In reply to a question Mr. Cole stated that it is the intention of his company to develop the type of motor described in the paper for hoist and traveling crane service, and that they intended to co-operate with elevator manufacturers to whom they will supply the motors and speed controllers. Mr. Renshaw considered that the motor described corresponded closely to the direct-current, compound-wound motor. The motor is in the same class for such work as cranes and hoists as the induction motor. For elevator service the compound motor is what is desired, but for cranes and hoists and work of that class a series motor is necessary to get the full advantage obtained from direct-current service. In reply to a question as to why 25-cycle motors are wound for 220 volts and 60-cycle for 110 to 125 volts, Mr. Renshaw stated that a high frequency required a larger number of commutator bars and that a high voltage would make the bars too narrow for mechanical running.

The discussion of the steam turbine was then taken up. In reply to a question, Mr. A. H. Kruesi stated that no turbines operating with exhaust steam are as yet in operation, but some are nearly completed and quite a number have been ordered. Two sets have been ordered by the Philadelphia Rapid Transit Company.

### LIGHTNING PROTECTION.

The paper by Mr. John A. Britton, of San Francisco, on "Long-Distance Transmission in California," was then read by title, after which Mr. Alex Dow read the paper by himself and Mr. Robert S. Stewart on "Present Methods of Protection from Lightning and Other Static Disturbances." In the discussion of the paper Mr. Dow said, referring to the water jet arrester, that this was merely a leg of high resistance and of no inductance, and that it consumes energy continuously. The water jet might be used to good purpose in many high-tension transmission lines as special protection during thunder storms in much the same way as in certain railway plants the tank arrester is switched on during thunder storms. In conjunction with choke coils it would furnish a thoroughly reliable means of protection, though its use involves a loss of energy from 3 to 10 kw, depending upon the voltage. Owing to information received since the report was prepared, the recommendation of two ground wires should be withdrawn in favor of the use of a single ground wire, which will do the work as well as two wires and be as reliable. No reliable information could be obtained concerning the horn arrester, but it seemed that the tail piece is dispensed with entirely in many European plants. Mr. Dow advised the appointment by the Association of a reporter to gather information on the subject of lightning protection and to report the same at meetings. In reply to a question, Mr. Dow said that flashing across storage battery terminals to ground has happened, the discharge being across the surface of the tanks. Mr. R. F. Hayward stated that in Utah there are about 300 miles of 40,000-volt and 200 miles of 28,000-volt lines running in parallel, and scarcely any storm passed through the territory covered without striking something, either directly or inductively. He has come to the conclusion that the lightning protection should be spread all over the line in the form of lightning conductors. It is found that when a storm occurs it will generally strike the lines and split a number of poles, shattering all the insulators on one pole and puncturing a number of insulators on other poles. The effect is seldom found far from the point where the stroke comes, and if the stroke is near the power house some apparatus is likely to be lost or terminals burned out. A number of transformers of the old air blast type have been lost, but none of those with new windings which have replaced the old type, although in a recent storm some of the terminals were burned off. The arc will cross from terminal to terminal, jumping distances of 5 or 6 inches, and while this shuts down the plant for a moment, no other damage is done. Recent experience has shown that modern insulation, whether of the air-blast or oil type, is becoming very good and very high. Mr. Hayward considered that the ground wire should be placed on the line; if there is no ground wire on the line, one of the two circuits is grounded at each end of the line when a thunder storm comes along. If a ground wire is above the other lines, it should be as far above as possible, for then the stroke will discharge to this wire and take the ground by a number of different paths, whereas if the ground is at the neutral point of the main circuit it is almost certain to cause an arc that will give a short circuit, and these sudden short circuits are the cause of setting up low-frequency waves which go into the power house, pass through the choke coil and are liable to break down the apparatus.

Mr. E. P. Dillon stated that the Colorado Springs lines were particularly menaced by lightning. At present lightning arresters are liberally distributed at the various plants and substations, but there are none on the line, since it is felt that the risk of having lightning arresters on the line was an offset to their advantage. He thought that a well-constructed ground wire would obviate some of the difficulties which have been met with. At three different times in the past two years the lines have burned out directly in the middle of a span, and not at the poles. Last December during a heavy wind there were some exceedingly severe static discharges from the lightning arresters which appeared to be heavy enough to destroy apparatus, though taken care of by the arresters. Lightning and static disturbances are practically unknown at high altitudes, while valley lines suffer severely. This he considers to be due to the fact that the clouds come down so low that there is not much of a chance for a great difference of potential between them and the earth. On the Pike's Peak hydroelectric plant there are installed a combination of spark gap and high-resistance arresters and a water tank, which combination has carried the plant through several severe storms. Mr. Dillon did not approve of barbed ground wire owing to the uneven quality of the wire, which caused it to break and give rise to more serious line trouble than from lightning. A well-made steel wire of good tensile strength would give very good protection and help out the regular arrester. At the main generating station high-resistance arresters were installed in combination with the spark gap; these did not completely take care of trouble and about two years ago they were put in a series parallel arrangement giving the discharge a straight path to ground or a split through the arrester, and since then there have been no discharges at the switchboard. Mr. George R. Stetson, of New Bedford, Mass., said that last December in two weeks more motors were destroyed than in all the previous 14 years in the operation of the plant, due to a static manifestation. Some of the motors were served by the underground system and some by the overhead system, and finally the trouble went beyond the motors to the station generators. The trouble to some extent has been remedied by putting up lightning arresters and kicking coils. Mr. Orville A. Honnold, of Salt Lake City, said that in experiments with lightning arresters several types had not given good results, and he believed that the Pike's Peak plan would solve the problem. Mr. H. T. Hartman criticized the suggestion to locate the ground wire at the center of the three-phase diagram for the reason that this would virtually reduce resistance

between the wires. Mr. W. B. Jackson, of Madison, Wis., stated that in northern Italy the water jet arrester has recently been put in use, and since then the former trouble from static effects has ceased. Mr. Dow stated that the water jets on the Italian lines are very satisfactory, and he thought that this was the most comprehensively reliable arrangement available for protection against either lightning or static discharges, when installed in connection with choke coils. The objection to the jets is that they take energy, but they may be held as emergency devices and thrown into service only upon the appearance of symptoms of static discharge. As to the position of a ground wire with reference to a three-phase line, this point would be at earth potential if, as is usually the case with Y-connected step-up transformers, the central station point of the wire is connected to the earth. He considered that the experience of Mr. Stetson was due to quick breaking of short circuits, which put a bad stress on a line. As to lines charged statically, sand storms produce the most aggravated cases. In conclusion he stated that it cannot be made too strong that the provision of low-resistance, non-inductive paths to ground is the perfect type of protection.

### NERNST LAMP.

Upon the conclusion of the discussion on lightning protection, Mr. E. R. Roberts, of Pittsburg, read his paper on "The Nernst Lamp: Its Present Performance and Commercial Status." Replying to a question concerning direct-current lamps, Mr. Roberts stated that arrangements have been made to distribute a number of these lamps to central stations for commercial tests, and the result of these tests will be awaited before the lamp is placed regularly on the market. Mr. Arthur Williams said that his experience in New York City showed that the Nernst lamp does not materially interfere with the field of incandescent or arc lighting, but fills a gap between the two. The light is of high quality and wherever used gives entire satisfaction. The three and six-glower lamps are more advantageous commercially than the single-glower lamp. The life is fairly satisfactory and the cost of renewal slightly over one cent per kw hour, and probably would be less than one cent were the lamps used to a larger extent. The income is substantially $11 annually per 88-watt glower, which is about twice the average income of an incandescent 16-cp lamp. Through the Nernst lamp the New York Edison Company has secured the return of a large amount of business which had gone to intensified gas burners. Mr. A. C. Dunham, of Hartford, Conn., said that he was using 3,500 Nernst lamps, and the lamp has filled the place so well that he did not see how he could possibly get along without it. As a displacer of high candle-power gas lights it is remarkable. The life of the glower is now from 800 to 840 hours, though one lamp has now been running over 1,700 hours. He did not think it advisable to get the full life out of the glower, as this would almost surely result in burning out the heater, which is a very expensive affair, the list price being 75 cents. Single glower lamps are not allowed to burn over 450 hours. In the case of a 50-cp Nernst lamp it would burn for the first 50 hours at 72 cp, then drop to 62 and stay there for 450 hours, after which it begins to drop more rapidly. He considered that if the price of glowers was greatly reduced sales would increase very materially. In reply to a question, Mr. E. R. Roberts stated that the Nernst lamp is used for street lighting in Unionville, Conn.; Sewickley, Pa.; Burlingame, Kan.; Burwin, Ill.; Goldfield, Nev.; Tonopah, Nev.; Golden, Col.; Deming, N. M., and Coalinga, Cal.

The evening session of Wednesday was opened by the reading of the paper by Mr. E. P. Dillon, of Colorado Springs, entitled "Some Investigations of Inductive Losses," which was followed by the paper of Mr. Wallace S. Clark, of Schenectady, entitled "The Choice of an Insulated Cable," and by that of Mr. P. D. Wagoner, Schenectady, N. Y., entitled "Mercury Arc Rectifiers." In reply to a question Mr. Wagoner stated that a 10-ampere vapor arc is not nearly as stable as a 20 or 30-ampere arc. In charging storage batteries if the counter e.m.f. of the battery rises above the voltage of the tube the arc simply goes out and the battery cannot discharge back.

### CENTRAL STATION ADVERTISING.

The following three papers were then read and discussed together: "Advertising Methods," by Mr. Percy Ingalls, of Newark, N. J.; "Sign and Decorative Lighting," by Mr. L. R. Vredenburgh, of Boston, and "Free Signs and Flat Rates," by Mr. R. W. Lee, of Newark, N. J. Mr. John Craig Hammond, of the Denver Gas & Electric Company, opened the discussion. He said that every piece of advertising literature issued by the Denver Gas & Electric Company has a theory or idea back of it, and he illustrated by some examples. He added that in Denver they do not copy the methods of any other company, but originate and create; that not a piece of advertising matter had been sent out that had been copied. In advertising, he said, the fundamental requirement is a solid proposition, something legitimate which really appeals to the public. Mr. John F. Gilchrist said that by looking over Mr. Hammond's display and the display of other companies which had sent advertising matter for exhibition, he had received a liberal education. He considered that advertising would pay even in small communities where every one knew about the lighting plant. The Chicago Edison Company felt that it was warranted in spending for advertising one-third of the entire amount set aside for getting business. Advertising would particularly pay when in a field that had been worked very strongly and where the last remnants of business were to be gathered in. In this case the cost of getting that business might be relatively high, and yet it would be profitable to pay it. Again, through advertising a large addition of business may be made in six months that otherwise might take several years. Mr. Ingalls said that in New Jersey the results obtained from small towns have been just as good as the results from cities. In reply to a question, Mr. Hammond stated that his company had not fallen below an advertising return of 10 per cent of prospects; that in some classes of advertising it had averaged 12 per cent and one particular class had averaged 63 per cent. Mr. Gilchrist said that in the branch of residential lighting the sale of current-consuming devices, such as electric heaters, etc., had increased 250 per cent since advertising had been started. Mr. Ingalls related a case where a plant, having been filled up to its capacity, advertising was stopped and solicitors discharged. The new business slowed up immediately, and after a few weeks no new business came in until the plant was in shape to take on more business, when soliciting and advertising were recommenced. In reply to a question Mr. Gilchrist said that the bulletin published by his company seemed to be much appreciated. About 35,000 were issued, principally being distributed through drug stores, and rarely more than 5 per cent were left over. Mr. C. W. Lee, of Newark, N. J., said that in a territory which his company had recently acquired, advertising and soliciting methods were put into effect and in a month's time more new business was obtained than during the previous year. He considered that an advertising appropriation should not be put into one booklet, but that five or six pieces of matter should be gotten out, issued two or three weeks apart. In reply to a question, Mr. Lee stated that in a city of 10,000 inhabitants his company expends about one-half of 1 per cent of its gross earnings for advertising. He stated that a large general advertiser like Wanamaker figured on about 2 per cent of gross receipts for advertising. Mr. Arthur Williams considered that advertising should go hand in hand with personal canvassing. Advertising appeals should be carefully classified and distributed, according to the kind of work in view. Mr. Williams spoke very highly of the sign advertising of Denver, both as to the extent and variety. His company is now using a panel sign which is furnished free, and very satisfactory results are obtained. He spoke highly of the Denver method of using reflectors in show windows, and he thought that it would pay companies to give special attention to the development of window lighting.

The discussion of advertising methods was resumed on Thursday morning. Mr. J. Robert Crouse, of Cleveland, read a paper on the subject and stated that the lamp manufacturers have contributed a fund of $10,000 to co-operate with central stations in the introduction of the incandescent lamp more largely, and suggested that other manufacturers of electrical apparatus should also contribute. Mr. L. E. Watson, of Kearney, Neb., stated that in his town he made a personal solicitation of the business people of the town and sent out personal letters. On particular days, such as holidays, and especially on New Year's Day, a neat letter properly dated and addressed was sent out, setting forth some point in connection with the electric lighting business. The office is decorated with ferns and other plants and the attention of visitors brought to the fact that such plants will grow where the electric light is used, but cannot be raised indoors where gas is burned. Mr. R. E. Allen, of Walla Walla, Wash., said that when he took charge of the plant in that place he began advertising to the extent of a full page in each of the papers weekly, and after two months the gross output had increased 40 per cent over the same month the year before, and that the output during the present year has increased 55 per cent over a year ago.

Attention was particularly directed to small motor business, and almost all of the power of the town is now provided electrically. In small towns it is a good point to tell prospective customers of their neighbors who are using electric power. Mr. James I. Ayer considered that in newspaper advertising a plan of campaign should be mapped out covering a period of not less than a year, the amount of money to be expended fixed upon and then arrangements made to spread it over a period of a year. He thought it was a good idea to make the central station office an advertising room, and attractive methods of showing up the office by electricity at night should be used and various electrical goods should be displayed, being kept in a presentable condition. When customers are shown goods and have concluded to try them the articles should be delivered to them at once. This keeps the samples fresh and the exhibition in good shape. Mr. F. W. Wilcox, of Harrison, N. J., endorsed the proposition of Mr. Crouse and hoped that it would be seconded by central stations.

Mr. T. C. Martin referred to the exhibit at the convention of advertising material and methods, and recommended that it should be repeated on a larger and fuller scale at the next meeting. He referred in high terms to the work being done by some of the larger companies of the country, and the proposition of Mr. Crouse would enable smaller companies to secure the benefit of expert assistance. He referred to the necessity of a comprehensive system in advertising methods, such as is employed by the larger companies, in supplementing their bulletins, circulars, etc., by letters and personal solicitation. He advised advertising in the newspapers, whether they praised the business or condemned it. In the latter case they advertise you, nevertheless, and the public has a capacity for reasoning out things for itself. Newspaper advertising is not merely that of paid announcements, for central station companies frequently have things happen in connection with their business which would furnish interesting matter for the reading columns. He suggested that part of the money offered to the Association for advertising purposes might be expended in getting up albums containing samples of advertising in the form of circulars, dodgers, follow-up letters, etc., and these circulated from one company to another of the Association membership, such albums being gotten up and put into circulation once or twice a year. He also suggested that the Association issue a bulletin giving the details of work done by each of the 500 or 600 companies in the Association, so that a comparison of methods could be made. Mr. Russell, of Massillon, Ohio, related his experience with central station advertising. In his town natural gas is sold at 30 cents per thousand cubic feet, but in advertisements kept ever before the public the benefit of electric lighting from the hygienic and sanitary standpoints and that of cleanliness are constantly pointed out. In newspaper advertising the matter is kept fresh by constant changes. The office has been fitted up also as a show room and decorated with plants. Mr. W. H. Gardiner, Jr., of Boston, said that his company also used billboard advertising and that in the fall this will be changed over to street car advertising. He considered that money is much better spent on large boards in prominent locations than on boards scattered throughout a city. The Edison Company of Boston has a neat and attractive button, used by all representatives, meter readers, etc., which is considered desirable from the advertising standpoint. Mr. John F. Gilchrist considered that it is much better to be specific in advertising than trying to cover the entire field in an announcement. People will read about some special feature who would pass by a general statement. Mr. C. W. Lee, of Newark, N. J., agreed that it is better to specialize all uses of electricity. Every central station should have an electric sign over its office, and he advised the use of changeable signs. Mr. Percy Ingalls believed that manufacturing companies would probably be glad to give central station people a small amount of apparatus for their display window.

### ELECTRIC HEATING.

Upon the conclusion of the lengthy and interesting discussion on central station advertising, Mr. Joseph I. Ayer presented his report on "Progress of Electric Heating." Mr. A. L. Selig, of Los Angeles, Cal., said that a year ago his company had only about a dozen flatirons on its circuits and now had more than 600 in laundries; gas irons with gas at 90 cents per thousand were displaced, current being charged for at three cents per kw-hour. The revenue from the irons was from 75 to 90 cents each per month. Heating of space by electricity has been a failure. In one town a lot of irons were put on 30 days' trial, and 65 per cent were taken for permanent use. Mr. P. H. Korst, of Janesville, Wis., stated in laundries a special rate is made for current for irons, but not in the case of residences. Laundries pay a minimum of 50 cents per month per iron, the average for families being about 11 cents. It was stated that about 600 laundries in the country now use electric irons, and the installations are growing. As to cooking, it is not practicable to do all cooking at a rate over 3 cents, but the expense is trifling in the case of chafing dishes, boilers, waffle irons, etc. Several cases were referred to in which the broiling for a family of four to six persons, coffee making and occasional use of a stove for toasting or light cooking in the evening, the use of the chafing dish and iron for pressing average in cost only about $1.25 per month, or an increase of 20 per cent in the lighting bill. The electric radiator has a particular field for use in the bathroom to take off the chill. In seashore summer homes and winter residences the electric radiator is a success. Mr. A. C. Dunham said he had designed and installed an electric oven which gives satisfaction, the charge for current being 2 cents. He had also installed eight electric heaters in a hotel, and six more have been ordered for a bathroom. Another heater is used in the bathroom of an orphans' asylum, the charge here being 3 cents. Mr. Arthur Williams said electric heating has attracted much attention in New York; 100,000 copies of a circular on the subject had been issued, and it had been found necessary to duplicate the edition several times. Mr. Williams gave the following costs for electric culinary apparatus: Chafing dish, $11.00 to $21.50, 1.8 cents to use 15 minutes; waffle iron, $7.50 to $18.00, 3.5 cents for 15 minutes; small flatiron, $5.00, ¾ cent to use 15 minutes. Recently customers were written to and asked if they had in use any of the electrical devices in an accompanying list, enumerating over 100 different articles. Exhibitions are given in various office buildings, and a cook goes from office to office of the company, staying in each office a month, where he cooks various foods, such as waffles, small biscuits and chocolate, which are served to the public free. Mr. H. W. Hillman related his experience of 20 months in electric cooking. At 5 cents per kw-hour his bill for electric cooking, an electric iron and occasional use of a heater in a bathroom has averaged about $6.00 per month and has never been higher than $9.00. This is for a family of four and a servant. In a house now building there will be no kitchen chimney, and there will be electric heaters in the dining-room, living-room, den and bathroom. In the present bathroom the heater is used almost every morning for six or seven months per year; the temperature is brought up from 45 to 50 degrees to 70 degrees in a quarter of an hour at a cost of 1½ cents. Mr. Hillman advised that central station managers should become customers themselves and thereby gain experience and encourage wiring residences for heating. Mr. Gilchrist, of Chicago, advised the attachment of a time device to electric heaters in order to prevent current being kept on after the heat is no longer needed. Mr. Arthur Williams protested against advocating the use of electricity for heating buildings, which he considered bad policy, and in this he was supported by Mr. J. F. Gilchrist, of Chicago, and Mr. W. H. Gardiner, of Boston, the latter also discouraging the heating of water by electricity. Mr. Ayer stated that for electric cooking current must cost 3 cents per kw-hour to compete with gas at $1.00 per thousand. It requires about 300 watts per day per person for electric cooking. The wiring should have a capacity of at least 35 and not more than 45 amperes for a family of four to six persons.

### DISTRICT HEATING.

Mr. W. H. Blood then submitted the report of the Committee on District Heating. In the report of last year's committee it was found that, of the companies answering the questions submitted, 84 per cent stated that "from all points of view their investment in the heating business was a good thing," and that 16 per cent were not satisfied with this business. The present committee submitted (1) some points that should be taken into consideration when contemplating the installation of a district heating plant; (2), a few suggestions as to how this portion of the business should be managed; (3), an attempt at a comparison of rates, and (4), a set of rules relative to customers' installations. It was stated that all direct-current plants are located near enough to the center of distribution to warrant district heating. For a central station which is a mile or more away from the center of the city, however, district heating is generally out of the question. An element of extreme importance is the relation of the cost of steam coal to that of domestic coal. In cities where steam coal costs from $1.00 to $2.00 per ton, and where domestic coal costs from $4.00 to $9.00, the company has much in its favor and should be able to make rates

that are at once attractive to the public and profitable to itself. It seems safe to estimate for ordinary conditions, where exhaust steam is used, about .2 pound of water per hour per square foot of radiating surface. So long as the demand does not exceed the supply of exhaust steam, but follows it closely, and the rates are kept up, the plant is in a fair way to make money; but any plant that undertakes to sell live steam on an exhaust-steam basis is doomed to failure. It is essential that rates be carefully fixed at the beginning of operations and that the cost of generating and distributing heat, plus proper investment, depreciation and dividend charges, be the basis of such rates. Theoretically, a meter rate is the only equitable one, but practically it may be found that a flat rate will answer the purpose fully as well. The report contained a set of regulations governing the supply of steam for heating purposes to be used for effecting an understanding between the company and its prospective customers, architects and steamfitters.

The final session of the convention on Thursday afternoon was opened by the report of Mr. H. C. Abell, of New York, on "Wrinkles." A notice of this valuable and very creditable report, which was presented to the convention in pamphlet form, will be found elsewhere. Mr. Abell called attention to the fact that he had included some rules and regulations which would be useful to those desiring to draw up rules for employes.

In the discussion of Mr. Blood's report, Mr. C. R. Maunsell, of Topeka, Kan., stated that his experience has been that a customer will use from 25 to as high as 50 per cent. more steam if he is on a flat rate. In his town the majority of customers are put on the meter basis, though much difficulty is experienced in getting away from a flat rate. He did not think that the committee should stand for flat rates under any circumstances, for if central stations do not charge on the meter basis they will have to go out of the steam heating business. He said that if companies would figure absolutely on a live steam basis and sell in that way, there is no question as to success, for every plant so operated is profitable. In reply to a question, Mr. Blood said that the figure .2 pound of steam per square foot of radiation is based upon average conditions and the average temperatures of a number of plants. He agreed it would be better to couple this statement with the range of temperature. Mr. James E. Pyle, of Westchester, Pa., said that his company has introduced a system of control in its steam heating main. At the customer's premises a reducing valve reduces the pressure to 5 ounces and holds it there, and each radiator is equipped with a half-inch valve. Water radiators only are used, and the company figures on 20 per cent more radiation than the ordinary single pipe system by using a valve at the top of the radiator with an index on it, which indicates whether there is enough steam being admitted to heat one-quarter, one-half or three-quarters of the radiator. Enough steam can be admitted to give the required amount of radiation for any kind of weather. The top of the radiator is heated to the first notch only, the water is condensed and goes to the bottom of the radiator, where it is chilled, and before it leaves the radiator all the heat is used in the apartment. This method overcomes the principal waste in steam heating which occurs during mild weather. In coming in from the street, the pipe is raised to the highest point, and it is drained by gravity where the pipe leaves the building.

### SALE OF ELECTRIC POWER.

Mr. E. W. Lloyd then presented his report on "Purchased Electric Power in Factories," an abstract of which appeared last week. In the discussion Mr. A. C. Dunham, of Hartford, Conn., said that his plant is now operating a little over 5,000 hp in motors. He referred to one case where a manufacturing company opened its books showing the cost of its steam power and agreed to pay 20 per cent. more for electric power, which offer was accepted. He has found that the output for the motor service is about 40 per cent of the rating of the motors connected. Mr. H. J. Gille thought that a good source of revenue could be derived by supplying power in the summer time where there are isolated plants; as one of the principal objects of such plants is to supply steam for heat during the winter, they could with profit be shut down in the summer time and current for lighting taken from the street mains. Mr. W. C. L. Eglin called attention to the fact that averages with relation to motor installations might not mean much for the reason that one or two large motors in a machine shop, for example, might give a large average, whereas many small motors might be in use. Mr. Gilchrist showed the desirability of determining the actual cost of steam power to a prospective customer of electric power, in order that figures could be derived to show the superior economy of electric power. He related an instance where, after such a study of a plant, an owner who had used some steam for drying lumber was induced to put in a hot air kiln for this purpose to use up refuse; it was then found that the cost for electric power per month involved a considerable saving to the factory. As to averages, taking the case of machine shops, which run from 12 per cent to 70 odd per cent of the connected load, to strike an average between the two, of, say, 40 per cent would give no criterion. Taking all the installations of, say, four motors or more, it would be found that the highest average is 62 and the lowest average is 40 per cent.

### CONVENTION NOTES.

THE ENTERTAINMENTS were a decidedly prominent feature of the Denver-Colorado Springs convention, but as might be expected where a man like Mr. Doherty had much to do with it, were duly subordinated in Denver. When the body got through its work at Denver—and it worked hard—it moved on to the Springs and there virtually play began, under the competent direction of Mr. George B. Tripp, of that city. Still there was plenty of recreation between whiles, even in Denver, and as there were so many ladies present this was not at all amiss. Upon the arrival of the delegates on Monday, June 5, plenty of members of the local committees were on hand to extent courtesies, and in the evening, as already noted in our special dispatches, there was a brilliant reception accompanied by dancing in the ballroom of the Brown Palace. Next day the ladies enjoyed a drive and luncheon at the Country Club, and in the evening everybody went out by car to Elitch's Garden in the outskirts to see the play of "Pretty Peggy." The afternoon of Wednesday was taken as a recess by the convention so that it could take in the broncho-busting contest in one of the parks; but to make up for their dissipation a very busy session was held in the evening until 10.30, while the ladies went to the theatre. The fun of the day was not over, however, for the men. An "athletic smoker" was given for them about 11 p.m. at Coliseum Hall, when sundry gentlemen with insulated fists distributed high voltage upper and under cuts to each other, resulting in at least three clean "blow-outs." These performances in the closed circuit were witnessed with critical delight by the large and intellectual gathering of lightning discharge experts. On Thursday, the last day in Denver, there was a street car ride for the ladies, and in the evening a serenade at the hotel by a rattling good drum corps. These and other hospitalities and courtesies enlivened the first half of the week very agreeably.

AT COLORADO SPRINGS.—On Friday morning the whole convention except such members as had stolen away for quiet the night before, was transported by special train to the Springs, and there a new round of festivities began in the stately white dominating presence of Pike's Peak, and under the management of an active and enthusiastic local committee. While there are no springs on the spot to justify the name of the place, there are plenty nearby at Manitou, and these and other scenic points of interest were all enjoyed during the remaining days of the week, including the Garden of the Gods—and of the beasts in nature-carven rock—the canyons, the seven falls and the noble Peak itself. The various steam and hydro-electric plants were also visited. On Friday evening there was a dance and concert at the Broadmoor Casino, and on Saturday a long railroad trip was made up through the passes of the Rockies to Cripple Creek, where all had an opportunity of seeing mines and mining operations in that famous treasure house of the precious metals. Sunday also was given up to further trips, and then the parties began to scatter, some coming back East or to homes elsewhere, but many remaining to make other excursions in the Rocky Mountains or as far out as the Pacific Coast.

TRANSPORTATION.—A great deal of credit is due to Mr. G. F. Porter, master of transportation, and to his Chicago aide, Mr. F. L. Perry, for the success of the special trains, note of which was made in our last issue. Mention must also be made of the work of Mr. Haller, the special agent who accompanied the Eastern special all the way through from New York to Denver and put it in eleven minutes ahead of time. Soon after arrival he was given a piece of jewelry as a little recognition of his efforts, the presentation speech being made very neatly by Secretary Dudley Farrand.

THE ADVERTISING EXHIBIT.—One of the novel and original features of the convention was the exhibit of advertising material and methods made by various of the larger local lighting companies. This proved a great success and is likely to be repeated on a larger scale at the next convention. At the request of Mr. T. C. Martin, chairman of

the Committee on Progress, examples of their work were contributed by the Denver Gas & Electric Company, the New York Edison Company, the Chicago Edison Company, the Boston Edison Company, the Detroit Edison Company, the Philadelphia Electric Company, the Washington (D. C.) Electric & Railway Company, the United Electric Company, of Baltimore. The exhibit comprised not only advertising material, but "follow-up" methods and letters, circulars, dodgers, postal cards, newspaper advertisements, posters and other features of the programme and campaign for securing new business—a department still so badly neglected by many companies. The largest exhibit was that of the Denver company, which being on the spot, was able to give a very complete exemplification of its clever work, for which the head of its advertising department, Mr. John Craig Hammond, once a Chicago journalist, has already won a national reputation. The exhibit embraced hundreds of pieces, many of them in color and some being originals. The beautiful exhibit of the New York Edison Company, sent by Mr. Arthur Williams, had as its piece de resistance some fifty very large photographs of the original designs, sketches, photographs, etc., and the smaller reproductions used in its Bulletin, the admirable and attractive pioneer of its class. These evoked great praise and were a center of attention. Supplementing this were albums of follow-up letters, postal cards, circulars, newspaper ads., etc., all arranged to tell their own story. Mr. Gilchrist, of the Chicago Edison, sent a similar but smaller display, and Mr. Vredenburgh, of Boston, sent a variety of their material. Albums of illustrative data, etc., were sent from Baltimore, Philadelphia, Washington and Detroit. Not only was the display inspected very carefully by all the delegates, but a large part of two sessions was taken up by the discussion of the subject.

THE ELECTRICAL WORLD AND ENGINEER, although a long way from home, was able, with the assistance of Messrs. Frueauff, Hammond, Farrar and Brady, to compile a complete list of those in attendance and to issue no fewer than four large daily register bulletins in handsome form. Each person was requested to fill up a registration card, whereupon a corresponding numbered pin badge was issued, rendering identification easy by means of the bulletin. That the bulletin was appreciated was shown by the demand for it. Altogether close upon 1,100 registrations were made, of which very nearly 700 were from outside Denver. The local company had about 160 of its staff in the Bulletin, and the others represented the various electrical and mechanical interests in Denver, the university, the city and State, etc. Such figures are most encouraging, not only as a vindication of those who wanted the meeting so far west, but as evidencing the continuous growth of the association in numbers, activity and widespread influence.

THE SECRETARIAL WORK of the meeting was, as usual, excellently well done. Mr. Farrand gave his attention to the meetings and the assistant secretaries, Miss Harriet Billings and Miss Douglass, conducted all the work and details of the main executive office, to which the Denver Company furnished a staff of about a dozen charming and efficient young ladies from the office force, all of whom were kept busy and were very useful in helping out visitors from the East. Part of this staff was attached to the convention hall for the issuance of papers, bulletins, etc., the system being so arranged that members could get their numbered batch of papers on arrival and leave them in the big envelope on departure, against the next session.

THE OFFICIAL SOUVENIR PROGRAMME prepared by the local committees was a very handsome pamphlet of 56 pages. It was profusely illustrated with portraits and views of local scenery and had on the green cover a neat little colored vignette of Denver itself. The contents were a list of the officers of the association, a list of the Denver and Colorado Springs committees, the programme of the convention, day by day; the various trips and excursions, and a variety of useful information as to the region, the railroads, the scenery and other features of interest about which a stranger would naturally want information. One excellent item was a chatty, off-hand history of the association, written in charming style by the assistant secretary, Miss Billings, who probably found leisure for composing it in her sleep.

THE CHAMBER OF COMMERCE, of Denver, an institution of great importance and growing influence, took an active interest in the visit of the association, and its members were prominent on the various local committees. A luncheon was given by its members on Thursday, June 10, in connection with the regular meeting, when to a large gathering of ladies and gentlemen an address was delivered by Mr. T. C. Martin on "The Progress of Electricity," a subject selected by the Chamber for the occasion. The audience, representing as it did the intellectual culture and commercial leadership of Denver, was evidently well informed as to electrical development and caught quickly all the points made.

THE PRESIDENCY of the association was an underlying topic and problem, and was not easy to determine as to its incumbent. The claims of one or two Eastern men, on merit and service, were too strong to be overlooked, but at the same time the leading spirits in the organization felt that it would be wise to select a Western man. The body is national in scope and character, a large number of the member companies lie west of the Mississippi, and it was felt that the association could now look even west of Denver and Doherty for its chief. A happy selection was, therefore, made in Mr. W. H. Blood, Jr., of Seattle, a young man of high ability and fine personality, while coming events were foreshadowed in the selection of Mr. Arthur Williams, of New York, for first vice-president, and Mr. Dudley Farrand, of Newark, for second. It is the recognition of this loyal service by its younger, rising men that makes the association strong and progressive.

ASSOCIATION DOCUMENTS. The Association issued to its active members at Denver three highly important documents. The first of these was the report on "Municipal Ownership," by Mr. Arthur Williams, a splendid piece of work, analytical, critical, argumentative, and offensive as well as defensive, carrying the war into the "enemy's camp" by showing how frequently and how generally municipal plants had proved economic and financial failures. A large number of plants are considered in it in detail, and Mr. Williams' results should be found extremely serviceable by persecuted central station men all over the country. The book is a volume of over 200 pages, carefully digested and indexed and bound in cloth cover. The other two productions given out were the "Question Box" and the "Wrinkles" pamphlet. The former, edited by Mr. Homer E. Niesz, is a portly volume of 594 pages, replete with information, containing 3,057 answers to 545 inquiries relating to all branches of the light and power art. "Wrinkles," edited by Mr. H. C. Abell, deals in like manner with minor problems of the business and in 117 pages gives a profusion of useful data. These three documents are alone worth to the members many times their annual dues.

ATTENDANTS.

Following is a partial list of those present representing central stations:

ALBANY, N. Y.—B. E. Morrow.
ALBANY, ORE.—Jos. H. Ralston.
ALBUQUERQUE, N. M.—W. S. Iliff, C. K. Durbin.
ALLIANCE, O.—D. W. Low.
ALTOONA, PA.—E. B. Green, J. Doss.
ANACONDA, MONT.—Herbert McNulta.
ARROWHEAD, COL.—William Rush.
ATLANTA, GA.—G. W. Brine.
BAKER CITY, ORE.—F. N. Averill.
BEATRICE, NEB.—A. G. Munro.
BEAUMONT, TEX.—Geo. E. Carroll.
BELOIT, KAN.—S. T. Rodgers.
BETHLEHEM, PA.—C. M. Walton.
BIRMINGHAM, ALA.—J. M. Bradley, J. M. Ritson.
BLOOMINGTON, ILL.—C. F. Snyder.
BOISE, IDAHO—J. W. Cunningham.
BOSTON, MASS.—W. P. Hancock, Irving E. Moultrop, W. H. Gardner, Charles H. Hodkinson, P. A. Brown.
BOULDER, COL.—T. H. Schaefer, William F. Smith, O. P. Patterson, Paul E. Temple, E. J. Temple.
BRIDGEPORT, CONN.—W. T. Oviatt.
BUTTE, MONT.—H. W. Turner, R. C. Kempy.
CAMBRIDGE, MASS.—Walter R. Eaton.
CANON CITY, COL.—Wm. T. Wallace.
CHATTANOOGA, TENN.—Byron T. Burt.
CHEYENNE, WYO.—D. F. Miner.
CHICAGO, ILL.—Jno. F. Gilchrist, Louis A. Ferguson.
CLEVELAND, O.—Samuel Scovil, S. C. D. Johns, M. E. Turner.
COLORADO SPRINGS, COL.—George B. Tripp, T. P. Bray, Ira A. Miller, D. Kennedy, Robert J. Clark, Stephen Connoly, M. V. Watson, E. P. Dillon.
CRIPPLE CREEK, COL.—Henry A. Goodridge.
CROOKSTON, MINN.—Ed. Peterson.
DE KALB, ILL.—W. H. Zimmerman.
DEMOPOLIS, ALA.—A. R. Smith.
DENVER, COL.—Claire N. Stannard, Ross B. Mateer, Geo. Steinwedell, D. M. Coughlin, Frederick Harry, Wm. H. Slavin, A. J. McMullan, Milan R. Bump, John T. Brady, V. A. Henderson, C. W. Koppleman, G. E. Williamson, B. Von Pontious, C. W. Humphrey, N. Miner, H. Zimmerman, Raymond Page, Geo. W. Bixler, H. H. Stevens, John C. Hammond, Edwin Wagoner, J. T. Connors, Duncan T. Campbell, F. A. Tewksbury, Frank C. Farrar, Thos. S. Richardson, Thos. F. Kennedy, I. F. Dostal, H. E. McGee, Wm. P. Risley, N. D. McPhail, H. C. Porter, A. Von Dachen-

hausen, W. C. Roberts, H. S. Russell, E. S. Taylor, Elmer Jackson, H. M. Taylor, Frank Frueauff, Edward P. Gartland, G. T. Pollard, R. G. Griswold, Ross F. Bump, Rufe Gentry, A. E. Reynolds, S. Tully Wilson, A. E. Reynolds, S. S. Campbell, G. T. Cogswell, H. B. Montgomery, Geo. Putnam, J. W. Proffitt, L. A. Reinert, Herbert W. Courville, S. A. Sewell, Geo. A. Hamilton, J. E. Harsch, W. J. Barker, R. B. Sullivan, Harry Hughes, R. H. Frazier, E. C. Means, T. R. Hopkins, T. K. Gerity, G. M. Karshner, John M. Connelly, Mrs. E. Y. Sayer, Geo. F. Willard, Chas. F. Heywood, J. Murray Weed, Cyrus Oehlmann, Roy Monroe, Howard Lockwood, Ph. D. Gleason, Henry Colburn, Wilson Carter, Irving Hale, Philip Cross, B. B. Root, Francis Ridley, W. F. R. Mills, O. B. Kohl, G. F. Bartlett, Mrs. John McGowan, Harry D. Frueauff, S. W. Cantrill, G. L. Coggswell, Jno. W. Miner, Jr., David M. Knox, A. R. Hall, J. P. Risley, H. R. Dodson, Jno. Braman, Odell M. Brown, A. M. Ballou, C. A. Trease, E. H. Pigeon, C. A. Johnson, W. C. Nollenberger, Harry R. Whitehead, W. A. Mahoney, J. A. Beeler, J. G. O'Brien, A. C. Anderson, Fred. S. Hartzell, W. E. Comer, F. A. Woodworth, Henry A. Tewksbury, C. E. Snell, Geo. S. Pearson, H. E. Smith, T. R. Ritchie, Ira L. Preston, John W. Bantsch, A. A. Blakeley, Chas. E. Pendleton, C. G. Keeler, F. L. Lindsley, Frank L. Cummings, L. D. Grim, W. D. Kesselring, Chas. E. Shimes, H. C. Hefner, Walter W. Martin, Wm. I. Moeller, Mrs. K. L. Moeller, Joseph Fugazzi, Glen Wilson, Hugo Feich, R. M. Staley, F. Brederlin, J. R. Huster, Jas. L. Stone, L. E. Wright, A. C. Bristol, Henry Frankel, Charlie E. Addie, Chas. Zuber, Wm. Lembach, Jas. Daily, Lloyd Shubert, Clifford Brown, Robert B. Jackson, G. F. Pease, H. S. Truesdell, Flora W. Evans, C. J. Caldwell, Phelps Buell, B. W. Evits, B. M. Lee, Joseph A. Bantsch, W. H. McAloney, Charles Tomlinson, J. G. O'Bryan, Robert B. Bonney, J. G. Sayler, B. H. Lynch, D. Lee Farrow, J. W. McDonough, Harry C. LaSalle, Frank H. Love, Dwight Johnston, A. S. McCormac, Clarence Keeler, L. H. Martin, E. L. Clyne, P. J. Monahan.

DES MOINES, IA.—R. H. MacMullan.
DETROIT, MICH.—Alex. Dow, Hoyt Post.
DULUTH, MINN.—C. E. Van Bergen.
DURANGO, COL.—A. Peters.
ELDORA, IA.—W. S. Porter.
EL PASO, TEX.—H. P. Scott.
EVANSTON, WYO.—F. Beckwith.
EVANSVILLE, IND.—W. B. McDonald.
EXCELSIOR SPRINGS—J. E. Lindstrom.
FALL RIVER, MASS.—Albert F. Dow.
FLORENCE COL.—Chas. Neely.
FORT COLLINS, COL.—H. E. Malcouronne, Nelson Touns.
FORT SMITH—Geo. H. Witmont.
FORT WAYNE, IND.—C. G. Guild.
FULTON, N. Y.—L. W. Emerick.
GEORGETOWN, COL.—Chas. J. Dewey.
GOLDEN, COL.—M. T. Morrill.
GRAND FORKS, N. D.—Thomas Roycraft.
GRAND ISLAND, NEB.—Charles E. Newton, O. P. Sells, J. C. Kenly.
GREELEY, COL.—Wm. Mayher.
GREEN RIVER, WYO.—Geo. H. Maxam.
GUTHRIE, OKLA.—Galen Crow.
HARTFORD, CONN.—A. C. Durham, R. W. Rollins, Henry F. Smith.
HILLSBORO, ILL.—Geo. T. Kester, J. J. Frey.
HOLTON, KAS.—W. E. Gant.
HOT SPRINGS, ARK.—J. E. Cowles.
HUMBOLDT, IA.—C. H. Brown, Jr.
JERSEY CITY, N. J.—W. W. Titzell.
KEARNEY, NEB.—L. E. Watson.
LAFAYETTE, IND.—C. H. Vinton.
LAMAR, COL.—Donald E. Bent.
LEADVILLE, COL.—Chas. Borttcher, F. C. Webber.
LEAVENWORTH, KAS.—Mrs. W. H. Fellows, W. H. Fellows.
LEWISTON, PA.—E. F. McCabe.
LINCOLN, NEB.—L. E. Hurts, Jas. S. Dales.
LITTLETON, COL.—Wm. C. Sterne, E. C. Sterne.
LOCKPORT, N. Y.—Oliver M. Diall.
LOS ANGELES, CAL.—R. H. Ballard, A. L. Selig.
LOUISVILLE, COL.—Jas. H. O'Hern.
LOVELAND, COL.—Ed Ridley.
MADISON, WIS.—E. W. Hale, Charles A. Frueauff, George Little.
MARCELLINE, MO.—Geo. W. Earle.
MARLBORO, MASS.—H. E. Ryder, George A. Highway.
MARYSVILLE, KAS.—J. E. Lindstrom.
MASSILLON, O.—W. E. Russell.
MEMPHIS, TENN.—S T. Carnes.
MERIDEN, CONN.—Chas. A. Learned, Samuel S. Gleason.
MOBILE, ALA.—J. H. Wilson.
MORRISTOWN, PA.—D. A. Bertolette.
MOUNT VERNON, N. Y.—J. T. Cowling.
MUNCIE, IND.—W. F. Warner.
NEWARK, N. J.—Dudley Farrand, Ed. J. Allegaert, Harry P. Chandler, John J. Gaffney, Percy Ingalls, P. S. Young, C. W. Lee, Paul Lupke.
NEW BEDFORD, MASS.—Geo. R. Stetson.
NEWTON, MASS.—Welles E. Holmes, F. Murdock.
NEW YORK, N. Y.—B. K. Sweeney, Arthur Williams, N. F. Brady, Henry L. Doherty.
NIAGARA FALLS, N. Y.—Joseph E. Montague.
NYACK, N. Y.—J. S. Avery.
NORTH TONAWANDA, N. Y.—A. S. Allen.
OAK PARK, ILL.—F. S. Richmond.
OGDEN, UTAH—Paul R. Shipley.
OMAHA, NEB.—John Harmon, S. E. Schweitzer.
ONTARIO, CAL.—E. W. Paul.
ORANGE, N. J.—Warren Partridge.
OTTAWA, ONT.—John Murphy.
OURAY, COL.—S. S. Thompson.
PAWTUCKET, R. I.—Orin Smith, Jr.
PEORIA, ILL.—R. L. Wallace.
PHILADELPHIA, PA.—A. J. DeCamp, H. T. Hartman, William C. D. Elgin, Wm. P. Conover.
PITTSBURG, PA.—R. S. Orr, F. Uhlenhaut, Jr., Mrs. F. Uhlenhaut, Jr., F. Uhlenhaut, Henry F. Cogshall.
PITTSFIELD, MASS.—Wm. R. Gardner.
PLAINFIELD, N. J.—R. P. Bache.
PONTIAC, ILL.—J. A. Carothers.
PROVO, UTAH—J. J. Nunn.
PUEBLO, COL.—John F. Vail, H. N. Gilbert, E. J. Spriull, C. M. Wright.
QUEBEC, CANADA—H. C. Abell.
QUINCY, ILL.—W. A. Bixby.
RAWLINS, WYO.—Julian B. Downey.
RED OAK, IA.—D. F. McGee.
RICHMOND, IND.—J. W. Roney.
ROCK SPRINGS, WYO.—L. D. Gray.
SAGINAW, MICH.—H. L. Brintnall.
ST. JOSEPH, MO.—C. F. Hewitt.
ST. LOUIS, MO.—O. M. Rau, W. C. Underhill.
ST. PAUL, MINN.—Paul Duty, Henry J. Gille.
SALINA, KAS.—G. H. Smedley.
SALT LAKE CITY, UTAH.—M. C. Godbe, O. A. Honnold, R. F. Hayward.
SEATTLE, WASH.—W. H. Blood, Jr.
SHENANDOAH, IA.—George F. Morse.
SHERIDAN, WYO.—E. C. Butler.
SIOUX CITY, IA.—C. C. Garland.
SPRINGFIELD, ILL.—A. V. Schroeder, R. C. Lanphier.
SPRINGFIELD, O.—Chas. S. Johann.
SYRACUSE, N. Y.—E. B. Doen.
TELLURIDE, COL.—S. R. Fitzgerald, C. G. Breck.
TERRE HAUTE, IND. —Chas. T. Mordock.
TOLEDO, O.—E. J. Betchel.
TOPEKA, KAS.—C. R. Maunsell.
TRINIDAD, COL.—D. S. Harper.
TUCSON, ARIZ.—O. S. Moore.
UTICA, N. Y.—M. J. Brayton.
VICTOR, COL.—W. N. Clark, Miss Sue Clark, A. S. Cooper.
WALLA WALLA, WASH.—R. E. Allen.
WASHINGTON, D. C.—H. W. Fuller, L. E. Sinclair.
WAYNE, PA.—John L. Mather.
WEATHERFORD, TEX.—S. O. Newton.
WELCH, W. VA.—Norman C. McPherson.
WESTCHESTER, PA.—Jas. E. Pyle.
WILLIAMSPORT, PA.—Ernest H. Davis.
WINONA, MINN.—A. G. Moser.
YOUNGSTOWN. O.—E. H. Beil.

## Pacific Coast Engineering Congress.

At Portland, Ore., on June 29-30, in connection with the exposition, will be held simultaneously the Pacific Coast Engineering Congress and the Transmission Convention. With the Congress have become affiliated the Pacific Northwest Society of Engineers, of Seattle, Wash.; the Technical Society of the Pacific Coast, of San Francisco; the Montana Society of Engineers, and the Pacific Coast Railway Club. The Pacific Coast Transmission Association, which is also connected with the Congress, will hold a session coincidently with the Congress, but independent of it except that the Association will convene with the Congress during its introductory exercises.

As yet the papers to be presented to the Congress have not been definitely determined upon, but the following papers are promised by the Northwestern Society: "Concrete Steel in Chimney Construction—Describing a Three Hundred-Foot Stack"; "The Cazadero Hydro-Electric Plant of the Oregon Water Power & Railway Company"; "Government Improvements at the Cascades of the Columbia River"; "Improvements at the Mouth of the Columbia River by the United States Engineers"; "Irrigation Papers by the Officials of the United States Geological Survey's Department of Irrigation." In addition to the above papers the Technical Society will submit the following: "Reinforced Concrete," by Lewis A. Hicks; "Pacific Coast Industrial Engineering Problems," by George W. Dickie: "Timber Tests: Methods and Results," by Loren E. Hunt; "The Principles Governing the Valuation of Water Works Under Private Ownership," by Arthur L. Adams; "The Struggle for Water in the Great Cities of the United States," by Marsden Manson; "The Débris-Restraining Dam of the Yuba River," by Captain W. W. Harts, U. S. A.; "Subterranean Water as Found in the Valleys of California," by John Richards. Other papers have been suggested, and there will undoubtedly be further subjects of paramount interest brought up for general discussion.

The headquarters of both the Transmission Association and the Engineering Congress will be at The American Inn, a first-class hotel which is run in connection with the Lewis and Clark Exposition.

## University of Illinois Test Car.

The electrical engineering department of the University of Illinois is having an interurban test car built by the Jewett Car Company, of Newark, Ohio. This car is 34 ft. 4 in. over the corner posts, and 45 ft. over all, vestibuled at each end, and has a double trolley, so that it can be run in either direction; it will weigh, with equipment, about 50,000 pounds. The interior is divided into a main compartment and an instrument room. The trucks have 6-ft., 6-in. wheel base, and 33-in. rolled steel wheels furnished by the Standard Steel Company. The electrical equipment consists of four 50-hp Westinghouse motors, with Westinghouse unit-switch system of control. The car is also equipped with Christensen independent air brakes, and electric headlights. The instrument room will be equipped with a complete set of graphic recording instruments, made by the General Electric Company and Elliott Bros., of London.

A car house containing a testing pit will be constructed at the university, where temperature tests of motor equipments can be made. All actual running experiments will be made on the tracks of the Illinois traction system, which is constructed with 70-pound steel rails, gravel ballast and steel bridges. This test car will be used to give students experimental work in connection with their course in electric railways, and also for thesis and research work. It is expected that in this latter respect it will be particularly useful to the electric railway interests of the country, as it will be available for any special investigations that may be desired. The car and equipment will be delivered in June, and will be ready for use at the opening of the next college year, in September.

The track of the Illinois traction system passes through the university campus, about 1,500 ft. being within the campus limits. This system is now completed from Danville to Champaign, and next year will be completed to East St. Louis, making a continuous trackage of nearly 200 miles. The Hon. W. B. McKinley, president of the Illinois traction system, and one of the trustees of the university, has given the university the free use of the tracks of the system, for experimental purposes.

## Missouri Independent Telephone Association.

About thirty members of the Missouri Independent Telephone Association met in Sedalia, Mo., June 8 for the purpose of revising the constitution and by-laws of the association to give greater scope to the independent companies. President Garry, of Macon, presided, and Frank S. Leach, of Sedalia, was secretary. One of the changes in the constitution will enable the Missouri association to become a member of the National Interstate Association whenever it may be deemed advisable.

The following delegates were elected to the national convention to be held in Chicago, June 20: Theodore Garry, of Louisiana, Mo.; J. A. Hudson, of Columbia, Mo.; O. C. Snyder, of Kansas City. The following alternates were elected: Dr. S. T. Neil, of Clinton, Mo.; A. B. Hughes, of Hardin, Mo.; W. B. Scruggs, of Harrisonville, Mo.; M. L. Gollday, of Holden, Mo.

The following-named officers were elected: Frank Buffum, of Louisiana, Mo., president; W. B. Scruggs, of Harrisonville, Mo., vice-president; Theodore Garry, of Macon, Mo.; J. A. Hudson, of Columbia; F. G. Taggart, of Richmond, Mo., executive committee.

## Harvard and Massachusetts Tech.

After lying dormant for some time, the matter of forming an alliance between Harvard University and the Massachusetts Institute of Technology is again to the front. Advices from Boston state that the corporation of the Institute met on June 9 and voted to accept the terms of the proposed agreement recently drawn up by the executive committees of the two institutions. The substance of the agreement was published in our issue of April 1. It will be remembered that the faculty and alumni of the Institute of Technology voted against the proposed amalgamation by large majorities. They do not relish the idea of subordinating the work of the Institute to that of Harvard College. Before the agreement can become effective three legal questions, one pertaining to Technology and two to Harvard, will have to be passed upon by the Massachusetts courts.

## Trees in Wireless Telegraphy.

Major G. O. Squier has been continuing his experiments on the use of trees as antennæ in wireless telegraphy, with most satisfactory results. Messages are now readily received at Benicia Barracks from San Francisco, a distance of 32 miles, using any one of the small trees at Benicia, and with the simplest sort of apparatus, which can be carried by a soldier on his person. The facility with which a station is established cannot better be indicated than from an extract from a recent report of Captain Saltzman, Signal Corps, at Benicia Barracks:

"With sending coming strongly, I suddenly ordered the station changed to a tree in front officers' quarters, 100 yards away. In three minutes had new station in good condition, reading signals plainly. We used but one tree, which was screened by a tree immediately in front and a small grove of trees about 100 yards away."

The experiments of Major Squier appear to indicate that in the distribution of condensed news, stock quotations, race track and sporting news, and so forth, it is now possible to transmit with the greatest ease, from a central station to any number of other stations, within a radius, say, of 100 miles or so, by means of the simplest sort of apparatus. This would permit temporary or permanent service to outlying country homes near any metropolis, since the one principal item of expense, namely, the installation of a permanent mast, is removed. Bearing on the present litigation over the aerial wire, it has been asserted that a living tree may be considered as a highly specialized form of earth itself, conveniently built up into a projection from the earth's surface, which one has only to lay hold of and convert to his use.

## CURRENT NEWS AND NOTES.

*CABLE RATES TO JAPAN.*—The Pacific Commercial Cable Company announces a reduction of 20 cents per word in the rate to Japan, taking effect July 1.

*UNDERGROUND WIRES IN BOSTON.*—The city of Boston, Mass., is well equipped with underground wires. It now has 255 miles of conduit and 1,641 miles of single duct, in which 2,046 miles of cable are laid. But there are still 15,094 poles standing.

*TELEGRAPHERS THREATENING STRIKE.*—A special dispatch from St. Paul of June 11 says: "Railway telegraphers employed by the Great Northern and Northern Pacific railroads will declare a strike unless concessions are granted at a conference to be held in St. Paul this week between representatives of the roads and H. R. Perham, national president of the Railway Telegraphers. The men have declared for an advance in salary and for extra pay for Sunday and all work more than ten hours a day."

*NEW YORK SUBWAY FLOODED.*—By the breaking of a water main in Forty-second Street, New York, Sunday afternoon last, the section of the subway between Thirty-fourth Street and Thirty-eighth Street was flooded, causing a suspension of business in that section for nearly 48 hours. Service was continued above the Grand Central Station and below Fourteenth Street, but the change of cars made necessary by the accident caused much inconvenience to passengers. Through service was not resumed until early Tuesday morning. The damage to the subway, it is thought, will reach $100,000.

*TELEPHONES A DEVICE OF SATAN.*—The invention of the telephone has been ascribed and awarded by the courts to Bell. The old German Baptists say it is an invention of the Devil, which seems different. A special dispatch from Indianapolis of June 14 says: "The National Conference of the Old German Baptists, which has been in session at Flora for the last four days, to-day adopted a resolution ordering all the members of the church to discontinue the use of telephones. There was a long discussion, in which it was argued that the telephone is a device of Satan, that it makes people lazy and that there is no warrant in Scripture for its use. The resolution not only requires the church members to abstain from the use of telephones, but any member who has one in his house must order it removed immediately. There was very little opposition to the resolution."

*SOUTHWESTERN ELECTRICAL ASSOCIATION.*—At the recent convention of the Southwestern Electrical and Gas Association the following-named officers were elected: President, M. M. Phinney, of Dallas, Tex.; first vice-president, J. W. McLendon, of Fayetteville, Ark.; second vice-president, E. W. Dunaway, of Paris, Tex.; third vice-president, J. W. Crerar; secretary, Frank P. Duffey, of Beaumont, Tex., and treasurer, A. E. Judge, of Tyler, Tex.

*MAGNETIC CLUB.*—The summer meeting of the Magnetic Club, of New York, will be held at College Point, L. I., Tuesday, June 27. Through the courtesy of the Western Union Telegraph Company the company's steamer, *Western Union,* will convey the club members to College Point during the afternoon, leaving Cortlandt Street pier at 1 and 4 o'clock. There will be a game of baseball and other out-of-door sports at College Point, and at 7 p.m. dinner will be served at Donnelly's Boulevard Hotel.

*GOVERNMENT TELEPHONY IN CANADA.*—Sir William Mulock, Postmaster-General of Canada, and the chairman of the Telephone Committee of the Dominion Parliament, will visit some of the cities and towns of Great Britain this month, where municipal telephone systems are in vogue. He will report the result of his investigations to his committee upon his return to Canada. He also proposes to consult with the authorities of the British Telegraph Department with a view to ascertaining how the trunk telephone system is being operated in the old country.

*INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS.*—Owing to conflict of dates with other societies, the date of meeting of the International Association of Municipal Electricians has been changed to August 23, 24 and 25. Secretary F. P. Foster, Corning, N. Y., reports that every sign points to one of the most successful conventions in the history of the body. The location of the city of Erie is a delightful one, and at the time selected for the meeting the temperature will be cool and comfortable. Mr. William Crane, the Erie member of the executive committee, has under way many plans for the entertainment of the association.

*NEWFOUNDLAND TAXES.*—The Colonial government of Newfoundland has, it is stated, introduced in the Legislature a bill imposing an annual tax of $4,000 on every telegraph cable landed on the coast of the island; a tax of 1 per cent on the traffic receipts of every telegraph company doing business in the colony; a tax of $4 on every telephone operated, and $4,000 on every wireless telegraph company doing commercial business, those which only report ships being exempt. So far the only company affected by the proposed law is the Anglo-American Telegraph Corporation, which operates cables, land lines and telephones, on which it will have to pay nearly $40,000 annually under this scheme of taxation.

*METER NOMENCLATURE.*—The London *Electrician* enters a protest against what it calls an "Americanism"—the use of the term "integrating wattmeter" *anglice* meter. The instrument in question is not, it says, a wattmeter, but a watt-hour meter, and the majority of patterns do not integrate; moreover, no new name is required for it. "Yet 'integrating wattmeter' is frequently used because, like many good things—and some bad ones—it comes from America. The adoption of this term has introduced a further complication, for it has caused an ambiguity in the meaning of the simple term wattmeter, which should mean nothing else than an instrument to measure watts, and in consequence a new name for this is now occasionally employed, namely, 'indicating wattmeter.' Such words as these are unnecessary, and have not the excuse of brevity; let them be abandoned."

*COMPENSATED DIRECT-CURRENT MACHINE.*—A patent issued June 6 to C. A. Parsons and G. G. Stoney, of England, relates to means for neutralizing the distortion of the magnetic field due to the current in the armature of a direct-current machine. The inventors propose to embed in the polar faces conductors which carry current opposed in magnetomotive force to the armature current. In order completely to annul the distortion of the field and to provide a sufficient counter e.m.f. between the coils of the armature when at the position for commutation so as to balance the reactance e.m.f. of commutation, the ampere-turns in the fixed coil are made to exceed the ampere-turns on the armature by an amount depending on the leakage coefficient of the dynamo and the reactance of the armature conductors. The scheme differs from the one originally proposed by Prof. H. J. Ryan in that the ampere-turns of the series winding exceed those of the armature by at least one and one-half to three times, to which specific proportion the claims are limited.

*LEBLANC ELECTRICAL RAILWAY SYSTEM.*—A system of electric traction unique in numerous details is disclosed in a patent issued June 6 to Maurice Leblanc. The object of the system is to eliminate the need of continuous contact between the trolley wire and trolley wheel, and for this purpose there is used a series of equally spaced supply points, at each of which sufficient electrical energy is fed to the vehicle to enable it to travel to the next supply point with an ample surplus to take care of accidents. As a reservoir of energy on the car, there is used a fly-wheel rotating at a very high speed. The fly-wheel is accelerated at each supply point by means of an electric motor, and it serves between supply points to run a dynamo to furnish electricity to the driving motors connected with the car wheels. It is stated that without subjecting the steel of the fly-wheel to a strain greater than 10 kg. per sq. mm., there can be stored 200,000 kg.-meters of energy in a fly-wheel weighing 320 kg., which energy is sufficient many times over to propel a heavy car between supply points 40 meters apart. The specifications relate mainly to details of the motor-generator. There is used a so-called fly-wheel dynamo which is supported in a frame hung on gimbal points, with the axis of rotation vertical, for the purpose of avoiding the evils of gyroscopic effects.

*AGAINST GOVERNMENT TELEPHONY.*—Mr. Herbert Laws, of London, recently appeared before the special Telephone Committee of the Canadian Parliament, and gave some testimony which reflects severely upon government control of telephone service. He stated that a government monopoly of telephones was a blight on the development of the service. This he had gathered from investigations in Europe. He referred to Vienna, where people were obliged to wait as long as three years for telephone accommodation. In Paris conditions were similar. If companies owned plants in these places, he declared, they would be reconstructed at once. Where most freedom was enjoyed by private companies the development was greatest. The splendid service in Sweden was due to the enterprise of companies and not state control as claimed by some. Mr. Webb deprecated legislative interference in the most emphatic terms. The municipal telephone in the old country, he said, was a dead issue. Of the hundreds who might have considered municipal schemes, only 100 did so. Of these only six obtained licenses and went ahead with the enterprise. Other licenses obtained and not acted upon, the Postmaster-General canceled in the last six months. A comparison of rates in Europe with those of Canada was not practical because cost of raw and manufactured material and labor, as well as density of population, had all to be considered.

*STARTING DEVICES FOR VAPOR RECTIFIERS.*—Two patents issued June 9 to Mr. S. Ferguson and Mr. R. E. Russell, respectively, and assigned to the General Electric Company, have for their common object to provide for the automatic starting of mercury vapor rectifiers. Each inventor proposes to tilt the rectifier for starting the arc, and for this purpose suspends the tube from a pivot and employs an electromagnet for oscillating the tube. The former inventor provides an auxiliary tube, containing mercury, which is mounted on the tilting member of the rectifier, so that the circuit to the starting anode, which is completed through the mercury in the auxiliary tube when it is tilted may be interrupted automatically as soon as the main arc is started and the tube returns to its central position. The latter inventor utilizes direct current from a storage battery for starting the arc, and, when the arc has been started, automatically shifts the connections so that the rectifier then charges the battery. To accomplish this result, in addition to the tilting device referred to above, the inventor uses a double-throw switch for changing the rectifier circuits from a resistance to the battery when a sufficient amount of current flows through the coil of an electromagnet which operates the switch. The coil of the electromagnet is connected in the delivery circuit of the rectifier, so that the switch is thrown immediately to the battery position when the vapor of the rectifier becomes conducting.

*AUTOMOBILES BURNED.*—Fire on June 11 destroyed the building at 281 Ninth Avenue, New York, in which the Ranier Vehicle Equipment Company had its automobile warehouse. A hundred automobiles, including many electric delivery wagons, were destroyed, entailing a loss estimated at $350,000.

*INDIANA ELECTRIC RAILWAY GUIDE.*—The Indiana Electric Railway Association is issuing a monthly magazine containing the official timetables of the electric railways in Indiana and indicating the rates of fare from Indianapolis to various points throughout the State. The magazine contains sufficient reading matter in the form of short stories and information concerning the railways to make it attractive to the users of the roads. It is stated that the circulation is 30,000 copies per month.

*WIRELESS TELEGRAPHY ON RAILROAD TRAINS.*—According to dispatches from Chicago a successful test was made, June 8, of wireless telegraphy to and from fast moving trains. Telegrams were sent to and from the Alton limited while on its way to St. Louis, moving at a high rate of speed. It is stated in this connection that this is the first time in this country that wireless telegraphy has been used in communicating with moving trains. Ten or twelve years ago tests were made with the Edison-Phelps induction system on the Lehigh Valley Railroad out of New York. Telegrams were successfully exchanged between the dispatcher's office and the train equipped with the apparatus.

*TIME-DEFYING COMPOUND.*—A London dispatch to the New York *Sun* states that a Hungarian chemist named Brunn has discovered a liquid chemical compound which, when applied to metals, stone, etc., renders these substances "time-proof"; that is, they are proof against decay. The discoverer asserts that the compound doubles the density of nearly every kind of stone and renders it water-proof. It imparts to all metals qualities which defy oxygen, and thus they cannot rust. It is also a germicide of hitherto unequaled power. The compound has been called "Zorene." Among the many claims made for it is that it will, at least, double the life of metals exposed to the air, such as in bridges, railroads, vessels and tanks.

*AMERICAN TROLLEY OVERHEAD WORK.*—Our London contemporary, the *Electrician,* in commenting on the recent A. I. E. E. papers on trolley overhead construction, says that while these papers and the discussions thereon prove that a certain amount of practical work is being done in the United States with alternating-current equipments and high-tension supply, this development of electric traction is still essentially in an experimental stage. The methods of insulation and suspension of the live wire show, it says, a considerable divergence from standard, 500-volt, continuous-current practice which is not surprising to those who have seen American overhead work in its native land. "Favored by climate and by a greater tolerance of the minor drawbacks of novel facilities, American overhead work, as a whole, is of a character which would not work satisfactorily in the United Kingdom nor, in fact, would it be permitted to exist here. With the substitution of alternating voltages running into the thousands, a great change in favor of security is imperative." It is noted that much prominence was given in the papers to European experience in this direction.

## Electrical Engineers of the Times—XIV.

PROF. VLADIMIR KARAPETOFF.

Vladimir Karapetoff was born in St. Petersburg, Russia, January, 1876. Both parents were students at the time of his birth, the father studying mechanical engineering and the mother medicine. The days of boyhood were spent in the Caucasus at the frontier between European Russia and Asia Minor, and at the age of sixteen he entered the College of Civil Engineering at St. Petersburg (Institute of Ways of Communication), from which he was graduated in 1897 with the degree of C.E. While a student the summer vacations were spent working on railroads in different parts of Russia—as far north as the Arctic Ocean and on the Trans-Siberian Railroad as far east as East Siberia.

Upon graduation a position was obtained in the Imperial Ministry of Ways of Communication, where Mr. Karapetoff did technical work in connection with the construction of, and repairs to, steamers and dredges used for the improvement of Russian rivers and canals, at the same time acting as an instructor in electrical engineering in his alma mater. In 1899 the Institute sent him to Germany for advanced study in electrical engineering, where he spent a year in the Darmstadt Technical High School, afterward taking short apprenticeship courses with two leading German manufacturing companies in Frankfort and Hamburg.

Upon his return from Germany to Russia in 1900 Mr. Karapetoff was assigned work in connection with the desgin of electrical machinery and plants in the Institute of Ways of Communication and also accepted a position as laboratory instructor and lecturer in the Electrotechnical Institute of St. Petersburg, which is maintained by the government for the training of telegraph and telephone engineers. At the same time he was retained by the Ministry of Ways of Communication for the study of the propulsive resistance of ships in connection with a plan for the introduction of electric traction on important Russian canals leading to the Baltic Sea. In 1901 he accepted a position as chief instructor in the electrical engineering laboratory of the new Polytechnic Institute of St. Petersburg, a modern technical university founded by Minister De Witte as a part of his great scheme of developing the manufacturing resources of Russia. Mr. Karapetoff took an active part in the design of the laboratories of the Institute, in working out courses of instruction and in designing and supervising the construction and testing of the power plant. In April, 1902, he received the advanced degree equivalent to M. M. E., and in the fall of the same year was given a leave of absence of two years to prepare himself for the chair of electrical engineering.

Arriving in the United States the fall of 1902, Mr. Karapetoff entered the works of the Westinghouse Electric & Manufacturing Company as a special apprentice, where he remained about a year and a

PROF. VLADIMIR KARAPETOFF.

half, passing through the different branches of the shops and testing department. In the summer of 1904 he was sent by the company as one of its staff to the St. Louis Exposition. His leave of absence expired in the fall of 1904, but having become attached to America and realizing that he had a larger field of activity here, he concluded not to return to Russia and resigned his position there. Soon after he accepted an offer from Cornell University to become assistant professor of experimental electrical engineering, which position he now occupies. This being a new department, the present duties of Prof. Karapetoff consist largely in selecting the equipment for an elaborate electrical engineering laboratory and in organizing the course of instruction. Juniors will be given a thorough experimental training in fundamental practice and in the handling of electrical machinery and apparatus, prior to taking up the theory of the same in the senior year. Another aim is to bring about close co-operation between the lecture room, the designing room and the laboratory.

Prof. Karapetoff is the author of a number of articles printed in Russia on resistance of ships to traction, polyphase electrical systems, the cause of hysteresis and Foucault currents, on Heyland's compensated motors, and a series of letters from the World's Fair. He has also written in German, and in English has contributed to the *Electric Club Journal,* to the *Transactions* of the American Institute of Electrical Engineers and the *Transactions* of the St. Louis International Electrical Congress. Prof. Karapetoff is an associate member of the American Institute of Electrical Engineers.

# Electrical Engineering at the Kyoto, Japan, Imperial University.

KYOTO UNIVERSITY, the second great university of Japan, is of comparatively recent construction, having been founded after the close of the war with China by an allotment of funds from the indemnity received from China. From the beginning, electrical engineering took a prominent place in the curriculum under the able administration of Prof. Masashi Namba, head of that department, a pupil of Mascart, in whose laboratory at the College de France he was for a time an assistant. When the course at Kyoto

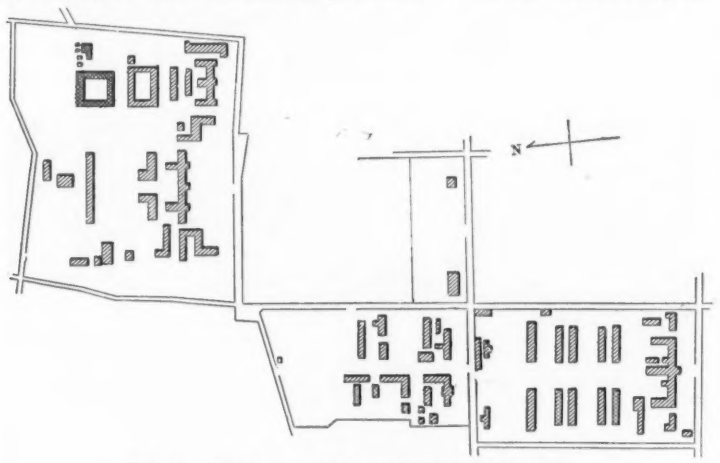


FIG. 1.—PLAN OF KYOTO UNIVERSITY CAMPUS.

was first started Prof. Namba gathered a large collection of electrical engineering material and fittings, donated principally by American manufacturers, with the object of illustrating lectures on practical subjects by specimens of the material, fittings, etc., referred to. He also proceeded to the building up of a general laboratory, which now in up-to-date equipment for the training of students in electrical engineering ranks favorably with the best of its kind in the world.

A description in outline of the laboratory follows, which, however, does not enter into many interesting details, such as switching arrangements, etc., which so greatly facilitate the organization of instruments, apparatus, etc., for teaching or testing work.

A map of the campus of the university is shown in Fig. 1, the buildings devoted to electrical engineering being located in the extreme northeast corner. The main building occupied by the department of electrical engineering was designed with special reference to the use to which it would be put. Among the prime requisites for an engineering laboratory may be noted adequate light and freedom from disturbances of delicate instruments. The building, as shown in Fig. 2, is a substantial brick structure one story in height. It has a frontage of 158.45 ft. and a depth of 198 ft., with an inner court 135.45 by 135 ft. The electrical laboratories are so arranged in the building that the heavy currents in the engineering laboratory are so far separated from the instruments in the more purely physical laboratory that practically no detrimental effect is produced upon the latter by the magnetism of the former.

A plan view of the building is given in Fig. 3, in which the various rooms are referred to by numerals. In the south side there are two standardizing rooms, 29 and 30, and a well-lighted drawing room, 28. The remaining rooms in this side of the building, 1-6, are used for delicate instruments, while the corner room, 7, is the professor's office. In the north side, the west corner rooms, 20 and 21, are work shops, the east corner contains a storage battery room, 16, and a high-tension testing room, 17, while in the middle part is located the laboratory for heavy-current engineering, 18, and an electrochemical laboratory, 19. In the east side there are an office, 8, a library, 9, a photometer room, 15, and five research laboratories, 10-14. The west side contains two store rooms, 22 and 23, two lecture rooms, 24 and 25, a museum, 26, and a special laboratory, 27. The building is equipped throughout with electric lamps, electric heaters and telephones.

The room used as a laboratory for the testing of dynamos and motors, 18, is 82.5 ft. long, 24 ft. wide and 17 ft. high. Special provision has been made for facilitating the arranging of electric apparatus as desired anywhere in the room. A three-ton, hand-operated traveling crane serves for moving the heavy machinery. Four lines of rails of U-shaped section, which are spaced uniformly 2 ft. apart in the concrete floor, are used for holding the machines in place (see Fig. 4). Each machine is mounted on a wooden frame of a special type, so that it may readily be attached to the rails. On either side of the room is a row of machines placed on brickwork foundations. These machines are driven by means of long countershafts on the side walls. The countershaft on the south wall is driven through a belt by a 5-hp, 100-volt, Edison bipolar motor, while the one on the north wall is driven by a 10-hp, 440-volt, A. E. G. direct-current motor, or by a 9-kw Schuckert rotary converter used as a direct-current motor. The machines on the brick foundations can be driven not only by the countershafts, but by the motors tem-

FIG. 2.—ELECTRICAL ENGINEERING BUILDING, BATTERY ROOMS AND POWER HOUSE.

porarily fixed on the rails. The portable machines can be located at any desired place and operated as generators or motors, according to the needs of the students.

In addition to the two motors specifically referred to above, the dynamo and motor laboratory contains a 1-lamp Brush arc machine, a 2-hp Stanley, two-phase, 60-cycle motor, a 1-hp Westinghouse three-phase induction motor, a 9-kw Schuckert 1-2-3-phase rotary converter, a 1-hp Shibaura (Japan) three-phase induction motor, a 2-hp Wagner single-phase motor, a 1-hp Shibaura single-phase rotary converter, a 2-hp Schuckert direct-current series-wound motor, a Schuckert motor-generator set, the two machines being connected by a flexible leather coupling, the field cores of each machine being provided with both series and shunt coils. There are also a 3-hp Osaka

(Japan) three-phase induction motor, two 2-kw, 110-volt, direct-current generators, a 1-hp Westinghouse direct-current, compound-wound motor.

Direct current is obtained from the switchboard at 20, 110, 220, 440 or 500 volts. Switchboards are equipped for supplying alternating

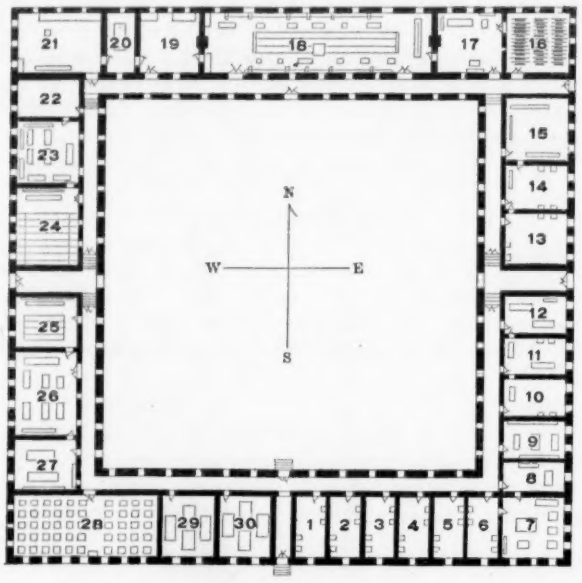



FIG. 3.—PLAN OF ELECTRICAL ENGINEERING BUILDING.

currents as obtained from the Schuckert and Shibaura rotary converters operated inverted, or from a 50-kw, 1,000-volt Westinghouse three-phase generator, which is installed in the central power house.

The central power house, an interior view of which is given in Fig. 5, serves not only to supply electricity to all parts of the university, but to give to the third-year students practice as engineers, and to afford opportunities for original investigation in engineering subjects. In addition to the Westinghouse alternator just referred to, the machines especially equipped for laboratory purposes are as follows: A 12.5-kw, 125-volt, General Electric, direct-current generators and two 4.5-kw, 500-volt, 50-cycle, Schuckert, three-phase alternators. One of these latter alternators is direct-connected to a 440-volt, Westinghouse, direct-current motor, while the other is belted to a 10-hp De Laval steam turbine.

The high-tension testing room (Fig. 6) is equipped with the following apparatus: Four 7.5-kw, 100 to 10,000-volt Stanley transformers; a 5-kw Westinghouse rotary converter, which transforms from 60-80 volts alternating current to 100-140 volts direct current; a transformer having a ratio of 1,000 to 60-80 volts for the rotary converter, and a 1-hp, 200-volt Westinghouse induction motor.

In the north side of the electrical engineering building are located a well-equipped electrochemical laboratory and a photometer room. The latter room is divided into many compartments by black cloths hung from the ceiling, the floor and the inside of the walls being also blackened. There are installed photometers of the Weber, Rousseau and the Lummer-Brodhun types, with many kinds of photometric standards and numerous styles of X-ray apparatus. Among

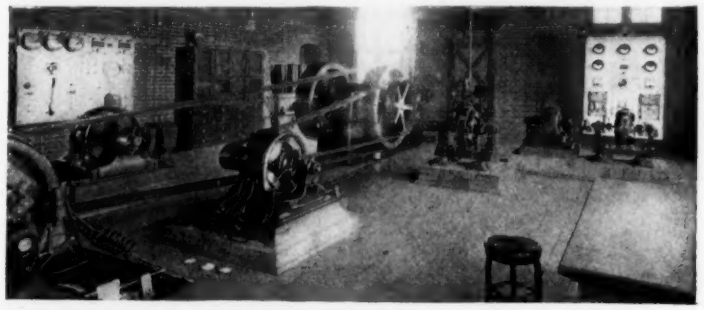


FIG. 5.—INTERIOR OF POWER HOUSE.

the various new lamps in use may be mentioned the Nernst lamp, the Cooper Hewitt mercury vapor lamp, an arc lamp with impregnated carbons and a singing arc.

In the center of the yard, which is surrounded by the electrical engineering building, is erected a 140-ft. pole made of iron pipe. This pole is used principally for experiments in wireless telegraphy. There is provided a special laboratory for containing the wireless telegraphy apparatus, most of which is of the Lodge and the Popoff-Ducretet systems.

In two rooms set apart for a standardizing laboratory extra care was taken to eliminate the effects of external disturbances upon the delicate apparatus there installed. To prevent vibration each instru-

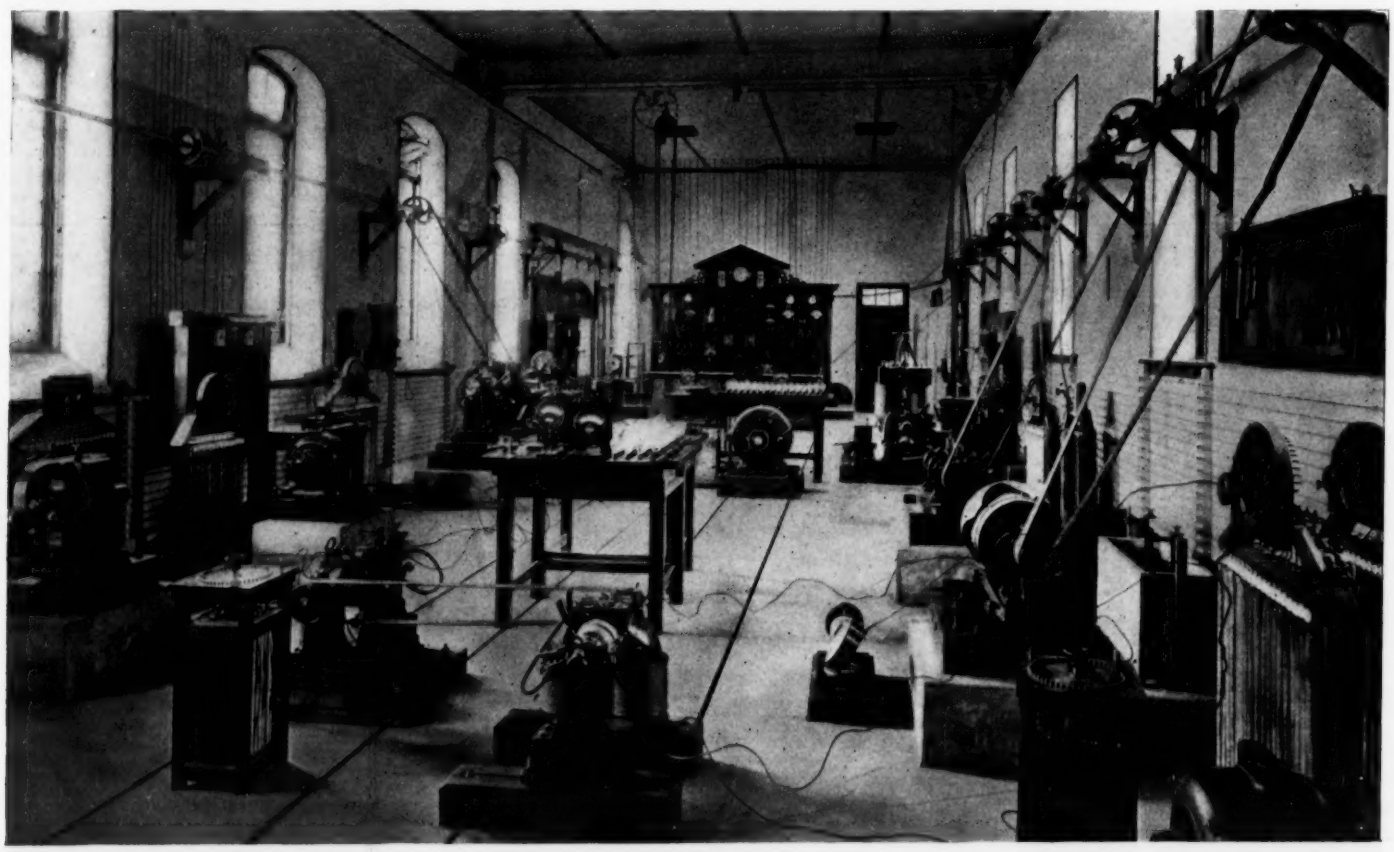


FIG. 4.—DYNAMO LABORATORY.

ment is placed upon a granite plate laid on a brickwork base. The important measuring instruments in the direct-current room are a potentiometer, standard resistances, Clark standard cells, adjustable resistances, storage batteries, etc., while in the alternating-current room are to be found two Kelvin standard balances, Weston direct and alternating-current wattmeters, voltmeters and ammeters, standards of capacity and self-induction, a Rowland electrodynamometer, a Weber electrodynamometer, etc.

There are two lecture rooms, seating 50 and 70 students, respectively. The latter is equipped with two independent supply circuits from the main switchboard of the laboratory, so that both direct and alternating current can be used for purposes of demonstration when desired.

In the library of the department is a large collection of books on

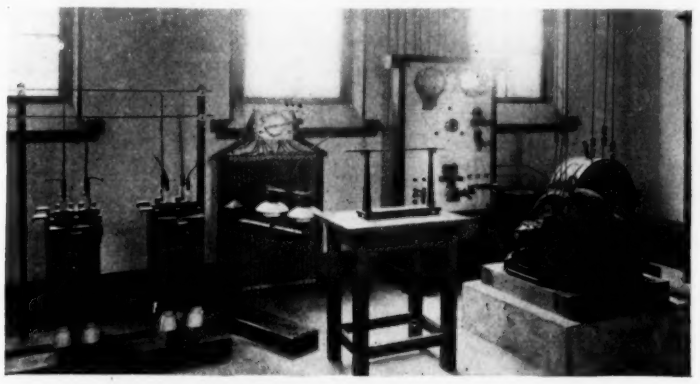


FIG. 6.—HIGH-TENSION TESTING ROOM.

physical, electrochemical and engineering subjects, most of them being written in English, German and French. The principal periodicals are received regularly, while all of the new publications of importance are obtained as soon as issued.

A partial view of the museum of the electrical engineering department is given in Fig. 7. It contains a large collection of instruments, apparatus and samples of materials relating to telephony, telegraphy, electric power, electric light, electric traction and electric heating. Among the collection may be found a 240-drop telephone switchboard, a selenium photophone, a Zickler photo-electric signaling device, a Franke contact-maker, an A. E. G. phase adjuster, four

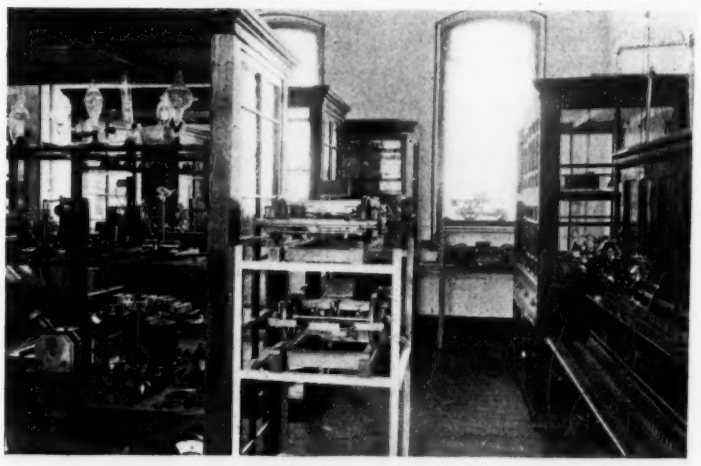


FIG. 7.—ELECTRICAL ENGINEERING MUSEUM.

models of Brill trucks, an electric furnace, frequency meters, galvanometers, samples of cables, conduits, etc.

The principal distributing circuits consist of a $2 \times 220$-volt direct-current, three-wire system used in parallel with a storage battery controlled by the end-cell method. There are two battery equipments, the larger one of which contains 188 Tudor cells, 100 having a capacity of $3 \times 42$ ampere-hours and 88 used as end cells having a capacity of $3 \times 60$ ampere-hours. The smaller equipment consists of 60 Tudor cells of $3 \times 36$ ampere-hours capacity and 60 E. P. S. cells of the same capacity. This latter battery is equipped with an automatic end-cell switch by means of which the pressure is kept constant at 110 volts. The switchboard in the main power house is so designed that the three direct-current generators installed there may be connected in series or parallel or joined with the storage batteries in any manner desired for particular cases.

The boiler room contains a 100-hp Heine water-tube boiler and a 50-hp Sterling boiler of the same type. The latter boiler is equipped with an under-feed stoker and a blower driven by a 1-hp, 440-volt, direct-current motor. Two motor-driven feed pumps of 0.5 hp and 0.75 hp capacity, respectively, are located in one corner of the room, and in the opposite corner there is a feed-water heater.

There are in use around the university more than 1,000 220-volt incandescent lamps, 11 arc lamps and about 20 hp capacity in motors for various purposes.

The teaching staff of Prof. Namba consists of two assistant professors, four lecturers and three tutors. The students enrolled in 1904 numbered 59. The first class was graduted in 1900 and the total of graduates to 1904 is 30. The practical character of the instruction is denoted by the graduating theses, some of the subjects of which have been as follows:

Transformer regulation; design of an electric lighting plant; compensation of alternating-current line drop; alternator armature reaction; choice of magnetic induction in design of small transformers; design of Arima electric railway; a study of the Nernst lamp; analytical study of the induction motor; design of a small power plant; speed control of electric motors; extension of power plant of the Kyoto Electric Traction Company; study of Faure battery plates; the correction factors of wattmeters; surging between parallel-connected alternators; design of a transmission line; most economical transmission for the Miyake railway extension; iron as an alternating-current conductor.

## External Reactance for Synchronous Converters.

BY CLARENCE P. FOWLER.

INASMUCH as there is a practically constant ratio between the alternating e.m.f. an the direct e.m.f. of a rotary converter, the possible range of variation in the direct e.m.f. is necessarily limited. In the case of the compound-wound rotary, the increase of voltage with increase of load is not the direct result of the increased field strength obtained from the series coils, but it is indirectly due to this cause co-operating with the action of external reactance to

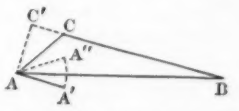



FIG. 1.—TRIANGLE OF E.M.F'S.

bring about an increased alternating e.m.f. impressed upon the collector rings of the machine, as will be shown in what follows.

To explain clearly the effect of external reactance on the regulation of the rotary converter, it will be necessary to establish the two following facts: That change of field strength of the rotary gives rise to a leading or lagging current through its armature winding according as its field is, respectively, strengthened above, or weakened below, a certain critical value, and that the effect of these leading or lagging armature currents when passing through an inductive resistance interposed between the rotary and the source of supply tend, respectively, to increase, or decrease, the alternating voltage applied to the collector rings and in turn to produce a corresponding change in the direct voltage.

So far as the alternating-current end of the rotary is concerned it may be treated as a synchronous motor, and there may be obtained three e.m.f's which effect the current flow in the armature. These are shown by the simple triangular diagram, Fig. 1, in which $A\ B$ is the impressed e.m.f., $B\ C$ is the counter e.m.f., which is, of course, proportional to the field strength, the resultant of these two e.m.f.'s being $A\ C$, which is active in producing current through the armature This resultant e.m.f. in the case of the ordinary synchronous motor increases proportionately with the increased load on the machine, the phase relation of the armature lagging just sufficiently with respect to the supply system to allow the proper additional current to flow to take care of the increased torque required. This means an increase in the angle $A\ B\ C$, and thus an

increase in the resultant *A C* upon which the value of the current depends.

In the case of the rotary converter, however, there is practically no transfer of mechanical energy, since the torque consumed by the direct current and the torque produced by the alternating current are applied at the same armature conductors, there being on the shaft of the rotary just that amount of torque necessary to overcome the mechanical and electrical losses in the machine. When there is an increase in demand for direct current there is a corresponding increase in current on the alternating end. This increase is equivalent to an increase in the angle *A B C*, Fig. 1, as with the

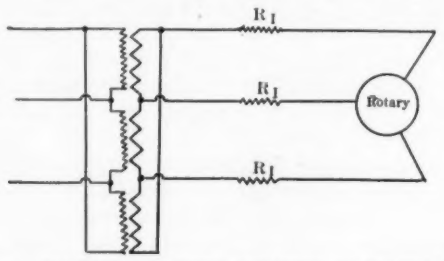



FIG. 2.—DIAGRAM SHOWING LOCATION OF REACTANCE.

plain synchronous motor. The phase relation of the armature current with reference to the resultant e.m.f. is fixed by the impedence of the armature winding. Assuming an armature impedence such that the current makes the angle *A' A C* (Fig. 1) with the resultant e.m.f. *A C*, then by increasing the excitation and maintaining the impressed e.m.f. *A B* constant, the point *C* takes the new position *C'*, and as the current represented by *A A'* is fixed relatively to *A C*, the new position of *A A'* is *A A"*, with the angle *A' A C* = the angle *A" A C'*. Thus, if *A A'* is regarded as lagging in phase behind the impressed e.m.f. *A B*, then *A A"* will be leading with respect to the impressed e.m.f. *A B*. From the above, it will be seen how a change in field strength affects the phase relation of the armature current with respect to the impressed e.m.f. The current will be lagging or leading, according as the field is weaker or stronger than a critical value, such that the line *A A'* coincides with the impressed e.m.f. *A B*, at which particular value the power factor is unity.

Having shown that the phase relation of the armature current and impressed e.m.f. is affected by the field strength of the machine, it will now be shown in what manner the impressed e.m.f. is changed by the action of these leading and lagging currents passing through an inductive resistance interposed between the rotary and its source of supply.

When a current in a rotary converter lags behind or leads the

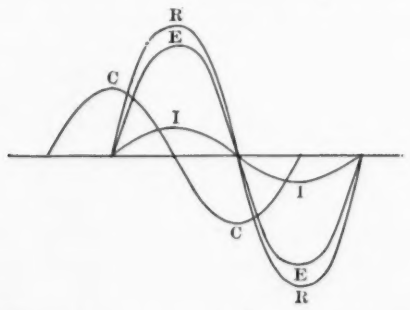



FIG. 3.—WAVE OF RESULTANT IMPRESSED E.M.F., CURRENT LAGGING.

impressed e.m.f., it may be resolved into two components, one an energy component in phase with the impressed e.m.f., and the other a wattless or magnetizing component in quadrature therewith.

The action of the wattless component of a leading current on the inductive resistance, $R_1$, connected as indicated in Fig. 2, may be shown by recourse to a diagram of the various e.m.f.'s and current involved, as shown in Fig. 3. In this figure, the curve, *E E*, represents the supply e.m.f. Since the wattless component of the current is of a leading nature it may be represented by the curve *C C*, 90 degrees in advance of the curve *E E*. Now, as the reactive e.m.f. generated in $R_1$, Fig. 2, is greatest when the current is undergoing the greatest rate of change, that is, when the current is zero, the inductive e.m.f. will be 90 degrees in phase behind the current, or in phase with the supply e.m.f., as shown by the curve, *I I*. This inductive e.m.f. will have such a phase relation with regard to the supply e.m.f. as to increase the latter, thereby forming a resultant which may be shown by the curve *R R* having its ordinates greater than the curve *E E* by the instantaneous values of the ordinates of the curve of the inductive e.m.f. *I I*. It is seen, therefore, that leading currents passing through an inductive resistance have the effect of raising the e.m.f. applied to the collector rings of the machine, and, as the ratio of conversion is practically constant, thereby similarly effect the delivered voltage.

As has been stated, by decreasing the field strength, the current is caused to lag in phase behind the impressed e.m.f. The action of the wattless lagging component of the current on the inductive resistance is shown in Fig. 4. In this figure, *E E* represents the supply voltage. As the current is wattless and lagging, it may be represented by the curve *C C*, lagging 90° behind the curve *E E*. The reactive e.m.f. generated by this current in $R_1$ is shown by the curve *I I* lagging 90 degrees behind the curve of current *C C*. This throws the inductive e.m.f. *I I* 180 degrees in phase behind the supply e.m.f. *E E*, or in direct opposition to the latter. The joint action of the inductive e.m.f. *I I* and the supply e.m.f. *E E* would, therefore, tend to reduce the latter by the amount of the former, leaving the resultant

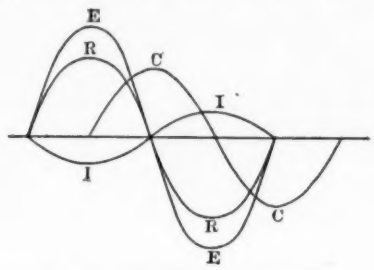



FIG. 4.—WAVE OF RESULTANT E.M.F. CURRENT LEADING.

e.m.f. *R R* to be impressed on the collector rings. Hence it appears that in order for a compound-wound rotary converter to regulate properly there must be a certain amount of reactance interposed between the alternating-current side of the rotary and the source of supply. For this reason, it is found necessary to insert reactive coils in the leads to the rotary when it is near the supply generator, as, for example, when the rotary operates from a generator in the same station, or where the distance between the two machines is not sufficient to have between them the reactance necessary for the proper compounding of the rotary.

## Some American Work in Electrochemistry.

In *Science* for June 9 is presented the paper read at the St. Louis World's Fair Congress of Arts and Sciences by Dr. Marcus Benjamin, entitled "Some American Contributions to Technical Chemistry." It is stated that the successful electro-deposition of nickel and its commercial development are chiefly due to the energy of Isaac Adams (1836- ), a resident of Cambridge, Mass. He carefully studied the subject and found that the failure to obtain satisfactory results was caused by the presence of nitrates in the nickel solutions previously used. His invention gave rise to prolonged litigation, but in the end he was victorious. Dr. Chandler thus describes it in the following words: "The novel proposition was presented to the court, of a patent for not doing something, namely, for not permitting nitrates to find their way into the nickel solutions employed in nickel plating, and the court held that the exclusion of nitrates was an essential condition of successful nickel plating, and that a process involving this condition was just as patentable as a process involving any other special condition necessary for successful execution, and the patent was sustained." Referring to the work of Castner, Dr. Benjamin said that in overcoming the difficulties encountered by Sir Humphry Davy, he devised a electric process of remarkable simplicity for obtaining metallic sodium from caustic soda by electrolysis. His ambition was not yet satisfied and he added to his triumphs a beautiful method for the electrolysis of common salt with the production of caustic soda and bleaching powder. Thus Castner invented the first process for accomplishing what French, German, English and American chemists had been working at for a hundred years. He never worked on a chemical process that he did not invent a better one to accomplish the same result; and it is not too much to say that he was the most eminent of American inventors in chemical technology in recent times.

# Some European High-Tension Switchboards.—II.

(*Concluded.*)

BY PROF. DR. F. NIETHAMMER.

AT Beznau, on the Aare (Switzerland), there has been installed by Brown, Boveri & Cie, a large water power plant which supplies a great many villages and various towns in the neighborhood with electric light and power. Eleven 1,100-hp, three-phase generators driven at 66.6 r.p.m., by water turbines with vertical shafts, generate 8,000 volts. The switchboards are connected on two separate ring bus-bar systems, one of which feeds the steady load for lighting, while the other feeds the very variable load of the electric railway. There is a third bus-bar set operating at 25,000 volts for all very remote places. The high voltage is produced by various sets of water-cooled, three-phase oil transformers, which are mounted on wheels and rails to be readily replaced in case of emergency. A double staircase leads from the machine house to the first floor of the switch house, at the front of which is erected an operation switch desk, shown at *A* in Fig. 10. On this desk, which is built up of cast-iron plates, are assembled all measuring instruments, switch levers and hand wheels for the generators and exciters; there is, however, no high voltage on or within this desk. All high-tension switches, etc., for the generators are shut up in a separate frame, *E*, below this floor. Opposite to this desk is erected a long, flat board, *B*, comprising the whole switch gear for the outgoing lines of 8,000 as well as of 25,000 volts. All high-tension apparatus for this operation board is in a spacious frame behind the flat board and is covered by perforated sheets. The back part of the first floor contains the transformer switchboards with 8,000 and 25,000-volt oil switches.

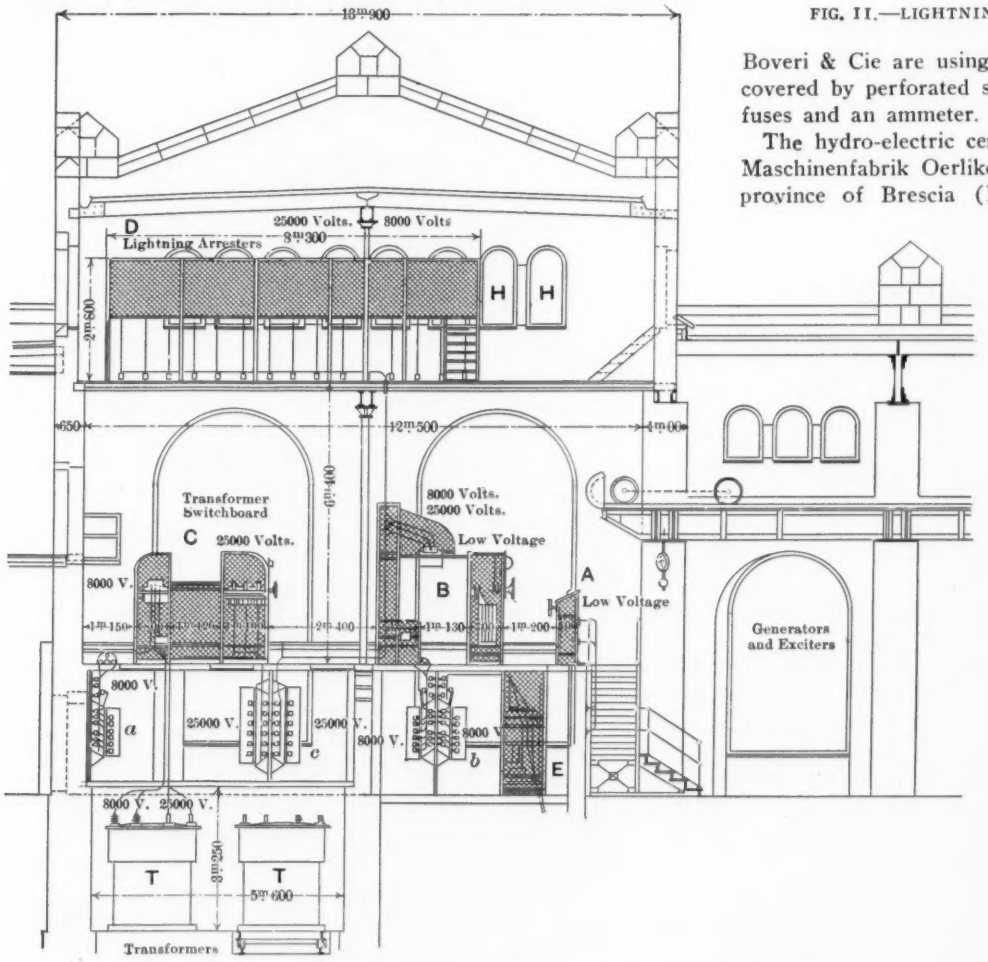



FIG. 10.—LONGITUDINAL SECTION OF SWITCH HOUSE AT BEZNAU.

The switchboard attendant stands between the desk, *A*, and the flat feeder board, *B*, and he easily controls all generator, exciter and feeder circuits of the whole station, and inspects at the same time the whole power house. On the same level with the power house, and directly below the operation boards, there are the various bus-bar systems of the closed-ring type. The outer ring, *a b*, is for 8,000 volts, the inner ring, *c*, for 25,000 volts. Below the bus-bar floor there are the transformers, *T*, and above the operation board that is in the second floor there are placed all lightning arresters. From this upper floor all transmission lines go off through the windows, the 8,000-volt lines on one side and the 25,000-volt lines on the other.

For three-phase motors for pressures up to 5,000 volts, Brown,

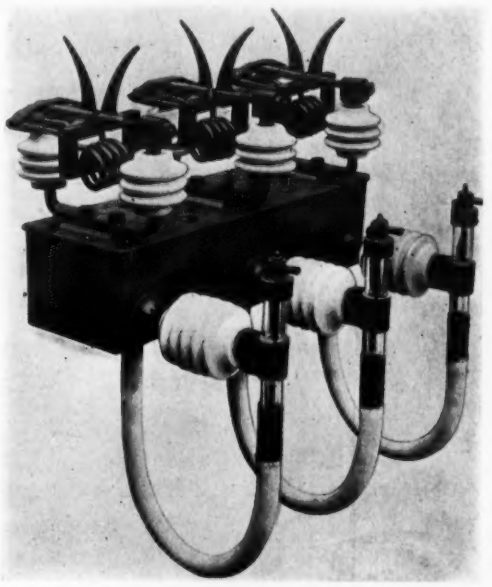


FIG. 11.—LIGHTNING ARRESTER OF THE OERLIKON COMPANY.

Boveri & Cie are using the switch box shown in Fig 12, which is covered by perforated sheet iron and contains an oil switch, three fuses and an ammeter.

The hydro-electric central station at Ponte Caffaro, built by the Maschinenfabrik Oerlikon (Switzerland), is intended to supply the province of Brescia (Italy) with electric light and power. At present the power house contains three 2,750-kw, three-phase generators designed for 315 r.p.m., 42 cycles, 9,000 to 10,500 volts. The e.m.f. is raised to 46,000 volts by three 2,750-kw water-cooled oil transformers; the water for cooling is carried not by copper coils in this case, but by channels in the upper part of the cast-iron oil tank. The three-phase generators are controlled by pillars, on which are mounted ammeters, voltmeters and wattmeters, the levers for the oil switches which are placed in a special room; the levers and hand wheels for the rheostats are also on these pillars. The move-

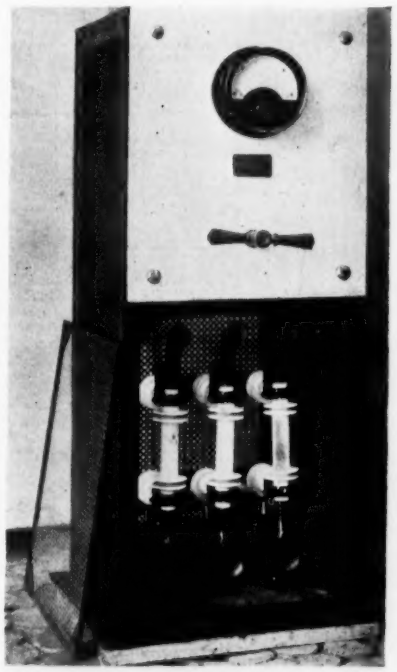


FIG. 12—MOTOR SWITCHBOARD.

ments of the main and exciter switches are mutually interlocked. A flat switchboard serves to control the connections of the low-voltage circuits of the transformers to the bus-bars by oil switches. The same board controls also all high-tension circuits. All gen-

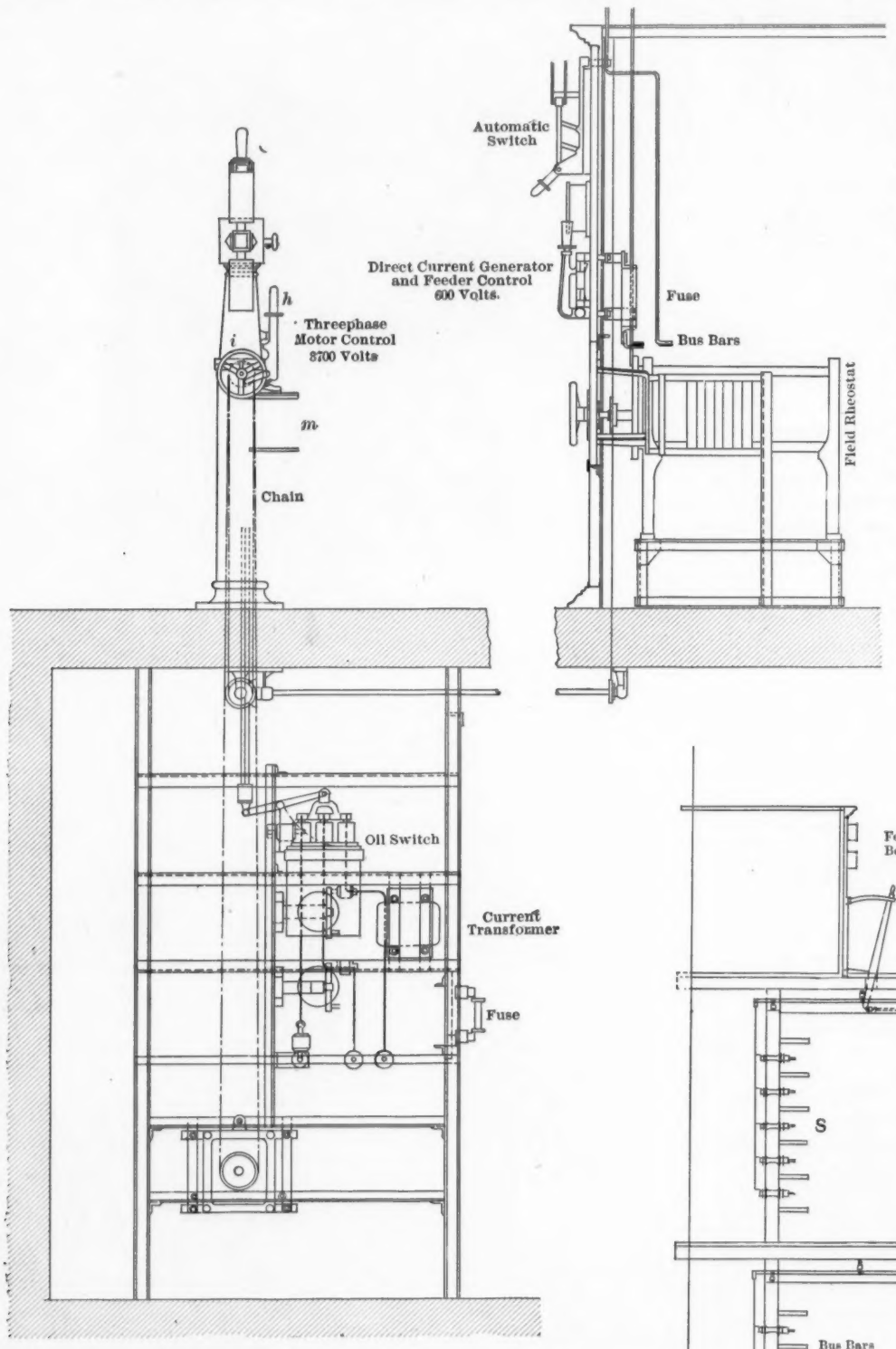



FIG. 13.—SWITCHBOARD FOR A MOTOR-GENERATOR SET.

erator switches and rheostats are installed in one room, all measuring or instrument transformers and transformer fuses in another room. The 40,000-volt circuits starting at the transformers run through oil switches to the bus-bars. The feeders are branched off from these bus-bars by motor-controlled oil switches. The upper floor is occupied by lightning arresters, which consist of horns of cylindrical spark-gaps and of water resistances. The normal design of the lightning arresters in clearly shown in Fig. 11. It consists of a spark-gap with horns, a magnetic blow-out with iron circuit and a water box. Fig. 14 represents another Oerlikon switchboard furnished to the town of Berne (Switzerland) for 3,700-volt circuits. The power circuits are three-phase, the lighting circuits single-phase. On the upper floor the switchboard attendant controls the generator pillars with the instruments, the switch levers and the rheostat hand wheels as well as the flat feeder switchboard. On the next floor are the rheostats, the instrument transformers with oil fuses, the generator oil switches, and on the back side one set of the ring-shaped bus-bars. On a level with the engine house there is a second set of bus-bars from which the feeders are branched off. The feeder switches, the instrument transformers and oil fuses for the feeders and the spark-gaps with grounded water resistances to compensate for any abnormal voltage rise are also on the ground floor.

A switchboard of the Alioth Company (Switzerland), for a sub-station transforming 3,700-volt, three-phase into 600-volt, direct current by means of motor-generators, is shown in Fig. 13. Two synchronizing lamps, four ammeters and voltmeters, the lever for an automatic oil switch with an overload coil and two hand wheels for the rheostats are fastened to the pillar. The rheostats are actuated by means of chains. The insulated wires run within metallic tubes laid inside the pillar. The flat switchboard controls the direct-current side of the motor-generator.

In the power house at Hauterive (Switzerland) the Alioth Company has installed as many single switchboards as there are generators, avoiding a central switchboard entirely. A single panel contains the main three-phase oil switch for 8,000 volts and about 1,000 kw with overload coil, all the measuring instruments, the exciter switches, the exciter rheostat and the synchronizing

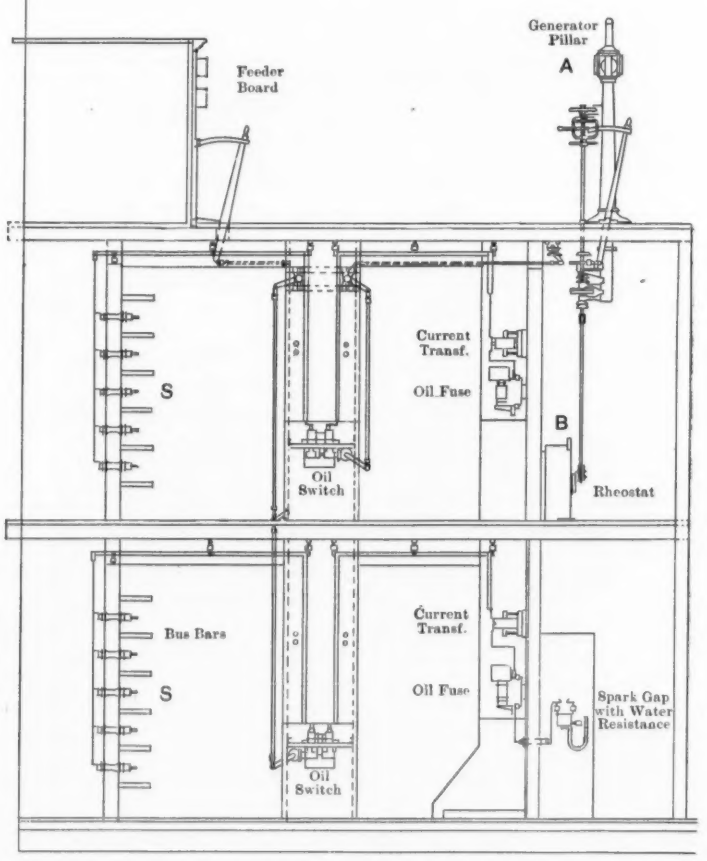



FIG. 14.—BERNE SWITCHBOARD.

lamps; the instrument transformers and the oil tank for the main switch are on the rear of the panel. The four sets of bus-bars are in a separate gallery in the upper story together with the various feeder switches. (See Fig. 15.)

The Allgemeine Elektrizitäts Gesellschaft, Berlin, has recently developed a system of removable switchboards on wheels or traveling

switchboard panels, as shown in Fig. 16. A box contains all the apparatus necessary for one generator or for one feeder. Each box

FIG. 15.—BUSBAR GALLERY AT HAUTERIVE.

has four wheels running on rails and can readily be removed. Between the oil switch and the wheels there is, however, an interlocking device which prevents any board from being drawn away as

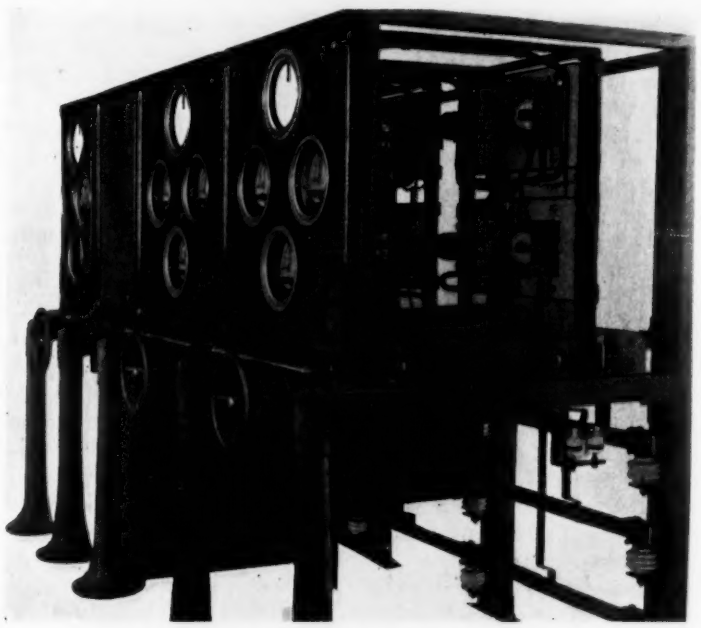


FIG. 16.—SWITCHBOARD ON WHEELS.

long as the main switch is closed. All boxes are connected to the bus-bars and to the generator or feeder leads by means of knife switches on the back side of the box.

## New Telephone Patents.

NEW TRANSMITTERS.

Harry M. Gail, of Buffalo, has invented a transmitter which is composed of two microphone buttons associated with two opposing diaphragms, between which the sound conducting tubes are run. A single mouthpiece, the center line of which is parallel to the plane of the diaphragms, breaks into two curved tubes. The whole transmitter is assembled within a tubular shell.

Another two-diaphragm transmitter is that of W. L. Wilhelm. In this a single microphone button is held between two diaphragms, one electrode secured to each. The curved sound tubes leave the mouthpiece and lead to the outside faces of the diaphragms.

A third form of transmitter is that of P. J. Tariel, of Issy-les-Moulineaux, France. Granular carbon is dispensed with and in its stead a quantity of minute carbon plates is used. These are obtained very thin and are placed in small pockets, with their faces in contact, and so arranged that there is not free space enough to permit them to pack.

A new transmitter has been brought out by Mr. H. P. Claussen, of Chicago. In this transmitter the usual plane diaphragm is replaced by one having a cup-shaped recess at its center, the diameter of the cup approaching half that of the diaphragm. Auxiliary to this diaphragm is a second diaphragm, perforated to hold the side wall portion of the microphone button, the periphery being riveted to the main diaphragm. Besides these metal diaphragms, there is the usual mica diaphragm of the solid-back transmitter, sealing one end of the carbon box, and a second mica diaphragm, peculiar to the Claussen transmitter, which seals the other end of the carbon box. It will thus be noted that the transmitter depends for action upon a plurality of diaphragms and it is reported to be particularly efficient. Mr. Claussen's patent has been assigned to the American Electric Telephone Company.

CODE SIGNALING TELEPHONE.

With party lines upon the code signal basis, as the number of stations per line increases, it is found increasingly difficult to prevent false signals. This is due not only to the tax upon the memory of users which additional code signals bring, but also to the additional skill required to ring clear signals as these become more and more complicated.

To provide against false signals under such conditions, Mr. C. T. Mason has produced his "Code Signaling" instrument. An auxiliary shaft is geared to the hand-generator crank shaft and each revolution of this crank steps the auxiliary shaft forward a short angular step. The auxiliary shaft carries contact discs cut to conform to the various code signals, each disc having its own wiper. A plug and jack serve to connect the desired wiper to the line, the jacks bearing numbers corresponding to those of the stations.

TELEPHONE CUT-OFF.

Such an exasperating thing as a "telephone cut-off" is certainly a novel device to patent, as most telephone users will declare them anything but novel. Nevertheless, under this title a patent has been issued for a device such that if two parties are conversing on a party line the attempt of any third to listen causes a cut-off and espionage is thus detected. It is probable that the remarks to the offending subscriber will be unfit for publication. H. Manning, of Weatherby, Missouri, is the inventor of this device.

SELF-RESTORING DROP.

The combined drop and jack illustrated in Fig. 1 is the invention of D. W. Campbell, of La Crosse, Wis. The action of the restoring feature is almost self-explanatory, the top of the plug striking the

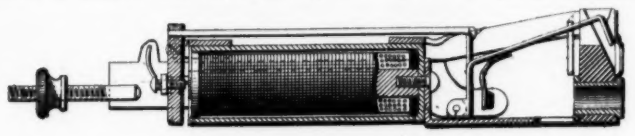


FIG. 1.—CAMPBELL DROP.

insulated nib and throwing up the shutter, where it latches. The patent is assigned to the Voight-Berger Company.

ANTISEPTIC DEVICE.

Walter Wright, of San Francisco, has been granted a patent for an antiseptic mouthpiece. This consists of a perforated metal cup adapted to be clamped upon a transmitter mouthpiece as though a lining for it. A considerable space is left between the rubber and metal and this space is partially filled with absorbent material saturated with an antiseptic. The disposition of the absorbent is so arranged as not to interfere with the free flow of air through the perforations in the cup.

A transmitter antiseptic device has been produced by J. M. Carrère, of Allentown, Pa., which is comprised of a disc of paper and an annular clamp, to hold it in place. The user is thus shielded from the air within the mouthpiece.

SWITCHBOARDS.

Between the extreme of manual and purely automatic switchboards there are many combination schemes which fall under the general class known as semi-automatics. Some of these tend toward the automatic and are nearly as complicated mechanically. Others merely relieve the manual operator from the manipulation of the usual keys.

It is a system of this latter class which has been patented by J. G. Roberts, of Evanston, Ill. In this the insertion of an answering plug connects the operator with a calling line. The insertion of the calling plugs causes the ringing, and the clearing of both lines gives the disconnect signals. The circuits are not very complicated and most of the apparatus is of standard telephone design. The system fails to provide means for the operator to listen in to supervise, except by the use of a manual listening key. The Kellogg Switchboard & Supply Company has been assigned this patent.

PARTY LINE RINGING.

In Fig. 2 there is shown a selective system for magneto signaling. The various sub-station generators give alternating currents. These have, however, no effect upon the sub-station bells, as it will be seen that these are connected differentially with respect to the lines. The central office drop will be affected. The selection when ringing

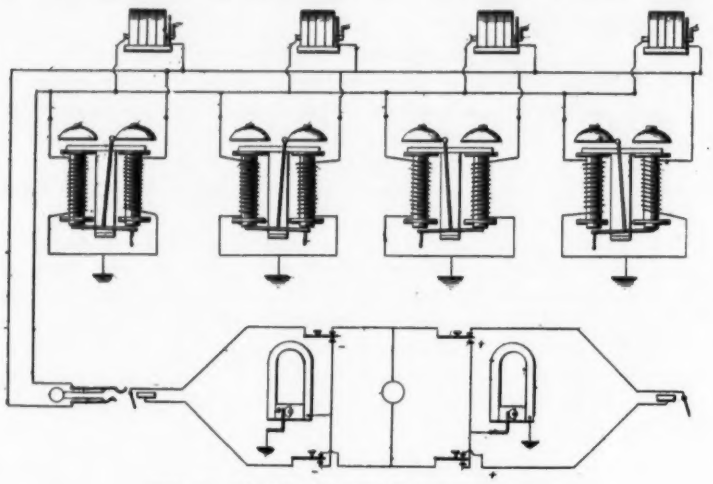


FIG. 2.—BASCOM PARTY LINE TELEPHONE.

toward the sub-stations is effected by ringing to ground from either side of the line with impulse currents of different polarities. This system is the invention of H. M. Bascom, of Brooklyn, N. Y.

John Mudgett and John Harveston, of Santa Cruz, Cal., are the inventors of a mechanical code ringing device, for non-selective systems. Code wheels are provided for each different code and a motor-driven shaft may be connected at will to any disc. By this means each code ring is given so distinctly that there can be no confusion due to careless ringing.

RINGING GENERATOR.

In Fig. 3 there is shown a sort of induction ringing generator. The core is given three windings, two equal and reversed primaries, and one secondary. A polarizing V magnet is placed so that one

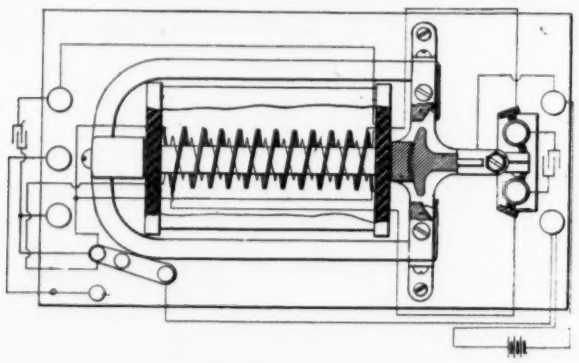


FIG. 3.—MALTHANER GENERATOR.

pole of the electromagnet lies in its field. An oscillating armature is then arranged to swing in front of the poles, its position being determined by which primary winding of the coil is energized. The device is made automatic by connecting contacts controlled by the oscillating armature in the circuit of a battery which feeds the primaries. The secondary coil gives out impulse to the line, induced by the alternating polarity of its core. Such a device will not ring many bells simultaneously, as this energy of the secondary circuit is extremely small, due to the great conversion losses between primary and secondary.

John C. F. Malthaner, of Minneapolis, is the inventor of this apparatus.

TELEPHONE SWITCHES.

George F. Archer, of New York City, has obtained a patent for a releasing switch for intercommunicating systems. The push buttons restore by spring power, and as one is depressed it not only makes the desired electrical connections, but in addition it so oscillates a locking bar that not only does it become locked, but in addition all other depressed keys are released.

A second patent which was issued to G. W. Lorimer, of Piqua, Ohio, describes a switch of the type wherein a wiper trails over contacts. With such, as usually made, a careless user may leave the wiper upon two contacts, thereby bridging them together. Mr. Lorimer makes a recess in each contact and forms his wiper spherically, so that it is in an unstable position, except when in a contact recess.

A third switch recently patented is what the inventor, C. V. Beaver, of Anita, Iowa, calls a "Multiple Switch." It is arranged so that a single telephone may be transferred to either one of two lines, an extension bell being simultaneously transferred to the other line. The switching is accomplished by what is virtually a double-throw, four-pole switch.

# LETTER TO THE EDITORS.

## Direct-Current Motors vs. Induction Motors for Machine Drive.

*To the Editors of Electrical World and Engineer:*

SIRS:—I have looked expectantly for some far more abler exponent than I for the direct-current motor, to set lance and ride a tilt against the assumption that the induction motor is better than it for variable-speed tool drive, as may be deduced from the article, "Electrical Equipment of a Railway Shop," to be found in your issue of May 27. It is possible that they feel that past tourneys have so often settled this matter in favor of the direct-current motor for this particular purpose that it is not necessary to ride again. Feeble a champion as I am, however, I cannot allow the challenge so clearly written to go unnoticed.

The issue is plainly this: Is the alternating-current system the best for use in a shop using individual tool drives and in which variable-speed motors are an important factor? Understand, the question is not whether induction motors can be successfully used in machine shops, but can they be used to equal advantage in machine shops where it is desired to vary the speed of the motors to accomplish part, if not all, of the speed control of the tools? It is granted in your editorial comment on the above-mentioned article that the operating efficiency of the induction, variable-speed equipment is no doubt somewhat less than that of the variable-speed, direct-current motor, but you claim that the advantages of uniformity of equipment and simplicity of the distribution far outweigh the shortcomings as to efficiency. Does the description found in the article describe such conditions? It says that:

(*a*) The generating plant consists of separate generators for power from those required for lighting, and in addition to these three units a fourth is necessary for exciting purposes.

(*b*) "The connections of the board are arranged with an idea of avoiding parallel operation of the generators."

(*c*) "The drooping voltage characteristics of the generators is dependent upon to protect them in case of short-circuits at the bus-bars."

(*d*) Separate circuits are required for lighting, which must be independent of the power.

(*e*) That transformers are necessary to change from three-phase to two-phase, with neutral wires in order to provide for distribution to this lighting; these transformers in most cases are placed in tunnels and their fallibility is acknowledged because in their largest installation "the secondaries of the two sets are arranged to be interconnected in case one set fails."

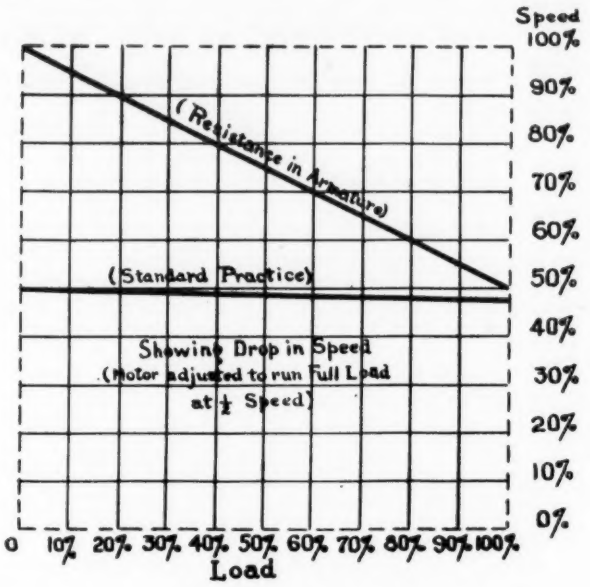
Compare the foregoing with a simple two-wire, direct-current plant in which the same generator is used for both lighting and power purposes; and when more than one is used the economies of load distribution are enjoyed because of parallel operation. The same conductors also may supply both branches of the service. Compact, efficient motors are used, having a speed range of at least 2:1, obtained by field control, the most convenient and efficient of all methods. These motors have unity power factors, better torque conditions and the clearance between armature and field gives safer mechanical construction than is possible with the induction motor.

Therefore, can it be said, if the foregoing comparison is correct, that the advantages of uniformity of equipment or simplicity of the distribution are on the side of the induction motor?

As concerns maintenance, there are numerous direct-current plants in operation of equal magnitude, in which the maintenance and

up-keep is equal to that cited in this case, and without the increased first cost, which is admitted for the latter.

But I have searched with great interest to find how the variable speed of the alternating-current motor in this case is obtained, in the hope that some new method has been applied. We are all free to make induction motors, and if some means can be found by which equal results can be obtained without commutators, we are willing




PERFORMANCE CURVES.

to do without commutators. The only thing I can find in this article is the following: "In all the variable-speed installations the different speeds are obtained by inserting resistance in the secondary circuits." That method you will recognize was abandoned 10 years ago as being incapable of meeting the requirements of variable-speed tool drive, which are now established to be as follows:

1. A range of speed of not less than 2:1 must be obtained from the motor itself.

2. This speed to be maintained constant at any speed within that range with the load varying from zero to full rating.

I have no hesitancy in saying that the variable-speed equipment installed in the St. Paul shops of the Great Northern Railway Company will not meet the foregoing general requirements of motor tool drive if they rely solely upon the one method which they refer to in this description. The attached chart will show falling off in speed as work on the motor increases.

Is the case in point a good one to select as illustrating an individually-driven shop? I doubt if the writer of the article intended it so to be. He says, "Because of their isolated position many of the machines are necessarily equipped with individual motors, but a general effort was made to use a single motor to drive groups of the smaller machines, requiring frequent starting and stopping." An analysis of the distribution of motors given in this article shows that out of 130 tools only 35 devices had separate motors, of which 12 had the motors belted from overhead and *only one variable-speed motor for tool drive is mentioned;* i. e., that one shown in Fig. 3 with a controlling device much larger than the motor itself.

Your editorial states "No direct-current machinery is involved in the distribution system whatever. All variable-speed operation necessary, being limited to variable-speed induction motors. This is being successfully accomplished as pointed out in the article, and results equal to those obtainable from the direct-current motor are being obtained." Would a careful review of this situation still warrant that same deduction?

In closing let me state that the electric motor has really only just begun to come into general use. Its future market is enormous, the demands of which are most varied—the alternating-current motor meeting the requirements to which it is best adapted, while the direct-current motor has its particular field.

The increase in alternating and direct-current motors will be like the increase in the population in which part will be boys and part girls. And the former will be dressed in pants and the latter in skirts and an exchange in either case would be equally unwarranted.

MILWAUKEE, WIS. ROBERT T. LOZIER.

# DIGEST OF CURRENT ELECTRICAL LITERATURE

## DYNAMOS, MOTORS AND TRANSFORMERS.

*Predetermination of the Short-Circuit Characteristic of Alternators.*—TORDA.—Under the supposition that during short-circuit the e.m.f. of the armature is negligibly small, the straight-line short-circuit characteristic is determined on the assumption that the total field ampere-turns, $A_1$, is equal to a constant, $C$, multiplied by the counteracting armature ampere-turns, $A_2$. The field ampere-turns, $A_1$, are $2izp$, where $2p$ is the number of poles, $z$ the number of turns per pole, and $i$ the exciting current in amperes. The armature ampere-turns are $0.9\ ZJ\lambda$ for single-phase alternators, $1.41\ ZJ\lambda$

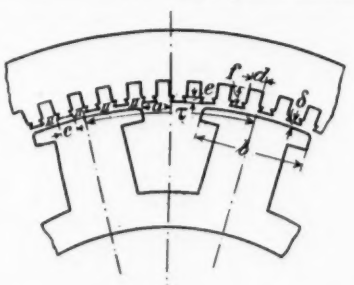


FIG. 1.—DIAGRAM OF SLOTS AND FIELDS.

for two-phase alternators, $2.12\ ZJ\lambda$ for three-phase alternators, where $Z$, the number of turns per armature phase; $J$, the effective armature current per phase, and $\lambda$ is given by the equation

$$\lambda = \frac{1.11\,b}{\sqrt{\tau}\sqrt{b - \frac{s^2-1}{3s}\frac{\tau}{s'}}},$$

where $b$, the length of the polar arc; $\tau$, the length of the polar pitch; $s$, the number of induced slots per pole and phase, and $s'$ the number of slots per polar pitch. The constant, $C$, is equal to $1 + r_0/r_2$, where $r_0$, the magnetic reluctance of the air-gap, and $r_2$, the reluctance of the circuit of the armature stray flux. For open slots the following equation is given for $r_0$:

$$r_0 = \frac{0.8}{\frac{b\,c\,l}{a\,\delta} + \frac{lb\,(e+0.5\,d)}{a\,(e+\delta)}}.$$

In this equation $l$ represents the armature length, while the other letters are explained by reference to Fig. 1. For closed slots the equation is

$$r_0 = \frac{0.8\,\delta}{l\,b}.$$

The reluctance, $r_2$, is given by the following equation, in which $L$ is the mean length of an armature winding:

$$r_2 = \frac{0.8}{\frac{4\,f\,l\,a}{d\,\tau} + \frac{4\,f\,c\,(\tau+a)}{\tau\,a} + (L-2\,l)\,0.5}.$$

The above formulas give values for the constant, $C$, which agree well with the experimental results. Since the value of $C$ varies between 1.02 and 1.6 or even more in machines of different types, the author recommends that when a generator is designed the short-circuit characteristic should be calculated with the aid of the above formulas.—*Elek. Zeit.*, May 18.

*Diseases of Electrical Machinery.*—Crocker and Wheeler.—A continuation of the serial, running for some months. The present article treats of troubles under the following specific heads: Speed too high or too low; motor stops or fails to start; voltage of generator too high or too low. The causes, symptoms and remedies of the various troubles are given.—*Am. Elec.*, June, 1905.

*Induction Motors.*—Rogers.—An article illustrated by diagrams giving notes on the theory and testing of polyphase induction motors.—Lond. *Elec. Eng.*, May 12, 19.

*Steel for Electric Machines.*—See the abstract on magnetic and electric properties of sheet steel and steel castings under "Electrophysics."

### Lights and Lighting.

*Emission Spectrum of the Arc.*—Kowalski and Joye.—A paper read before the French Academy of Science. Experiments of the authors appear to prove correctness of the theory that the starting of an arc requires the evaporation of the metal of the cathode. They obtained photographs which show a spectrum due to nitrous vapors which form in the arc, while next to the cathode there are seen lines due to the cathode metal. These lines appear only at the cathode, as may be shown by reversing the current.—*L'Industrie Elec.*, May 10.

*Incandescent Lamps.*—Bainville.—An abstract of a paper read before the International Soc. of Elec. in Paris. The author gave a review of various new types of incandescent lamps. In the discussion Guilleaume spoke on the lamp efficiency and thought that a figure of three per cent, as indicated by Bainville and other authors, is too high; he thinks we cannot count on an efficiency higher than 0.5 per cent with actual incandescent lamps.—*L'Industrie Elec.*, May 10.

### Power.

*Size of Units in Power Plants.*—Snell.—A reply to some articles pleading for larger units in central stations. The author points out that in the central station one does not get such good results as from marine service simply because the load factor on a run from port to port is nearly unity, which is not the case in a station. "Many engineers would say that in a city as large as Edinburgh, having a total installation of 11,257 kw, it is ridiculous to have 750-kw sets as the largest unit. Examine the Edinburgh accounts and one will see that the results are of the highest order of merit. It may be argued that even better results would be obtained were the sets larger. Now one doubts this. It is because there are so many sets that these excellent results are obtained, considering the load factor (0.173). This divisibility into small sets reduces the amount of stand-by plant, though it is admitted the capital cost per kilowatt of plant installed is somewhat higher. On the other hand, were the Edinburgh works used for traction purposes only, with a much better load factor, then it would be undoubtedly a mistake to have so many sets and probably six 2,000-kw units of plant would represent better engineering. Obviously, the logical conclusion is that in determining the proportion of the unit to the total plant installed, the estimated load factor must have much to say in the matter." In a station for power or general purposes the probable total amount of plant divided by 10, plus 2 stand-by sets will fairly represent the correct size for any given station. Thus, if it is estimated that 7,500 kw will supply the ultimate needs of a particular town, twelve 750-kw sets would be installed. Similarly, if a 50,000-kw station be required, twelve 5,000-kw sets. "Nor does one think that seven (not six) sets of 1,500 kw and 10,000 kw would be so good either in first design or in financial results; and not even the advent of the turbine for larger sizes weakens this conclusion."—Lond. *Elec.*, May 12.

*Tunnel Building.*—Hruschka.—The first part of a paper on the use of electric power in tunnels, especially for ventilating, pumping and drilling during building. For driving ventilators, direct-current shunt motors with field regulation would probably be the best ones. But in view of the fact that the generating station is generally at some distance, three-phase currents will often be preferred. They are used throughout for driving the ventilators on the various tunnels which are now being built on Austrian railways, and regulation is obtained by varying the effect of the ventilators by adjusting the air valves.—*Zeit. f. Elek.* (Vienna), May 20.

*Electricity in Mines.*—Ravenshaw.—An illustrated abstract of a recent lecture in which the author dealt especially with the difficult electrical problems involved in winding engines for mines. He also spoke of electric locomotives and electric pumps. He thinks very highly of three-throw and Riedler pumps. Regarding generation and distribution, he mentions the curious fact that insulation resistance can be better maintained underground than on the surface. This is due to the large amount of coal dust and escaping steam on the surface. The lecturer thought that gas engines with coke ovens would probably be used a great deal in the future.—Lond. *Elec.*, May 19.

*Electric Power in Coke Plant.*—An illustrated description of the electrically-driven Sement-Solvay coke plant of the Wigan Coal & Iron Company, Limited. The special feature is the use of three-phase currents for power purposes, although some of the machines require variable speed. Lond. *Elec. Rev.*, May 12.

*Planing Machines.*—Benjamin.—A profusely-illustrated article on drives for planing machines with special reference to American practice in motor connection.—*Cassier's Mag.*, June.

*Engine Room Chemistry.*—Gill.—The first part of a serial, the object of which is to enable the operative engineer in a power plant to gain some familiarity with the substances with which he has to deal.—*Power*, May.

*Italian Water Power Station.*—Bignami.—An illustrated description of the hydro-electric installation of Turbigo in Lombardy. The generating plant comprises five electric generators, each driven by a 1,500-hp turbine with a horizontal shaft. Each generator gives three-phase currents at 11,000 volts, with a frequency of 50 cycles per second. The bulk of the power developed, amounting to 3,500 kw, will be transmitted over three overhead lines and distributed mainly in the neighborhood of Segnamo, while the remainder of the power, amounting to about 1,000 kw, will be distributed to new factories engaged in the cotton industry in the region between Saramo and Rho.—Lond. *Elec. Rev.*, May 19.

*Niagara Falls.*—Adams.—An article pointing out that it would be practicable to develop some 1,500,000 electrical hp from the gorge rapids, and that it would, therefore, be unnecessary to spoil the American falls.—*Eng. Mag.*, June.

*Steam Turbines.*—Mohun.—An illustrated article on the De Laval steam turbine in America as applied to other than electrical apparatus.—*Cassier's Mag.*, June.

### Traction.

*Electricity on Steam Railways.*—Street.—A paper read before the Western Railway Club. The author emphasizes that at the present time the demands of heavy suburban service are beyond the capacity of steam locomotives and the indications are that within a few years a large proportion of this service will be handled by electric equipment. The technical advantages of motor cars over locomotives are pointed out, and data are given on the increase in gross receipts, the increased capacity of the present terminals, the reduction in operating expenses and the reduction in terminal costs. A great many data are given on the maintenance of equipment. The total operating expense per car-mile varies from 10.2 to 17.39 cents, and the average is 13.14 cents per car-mile. The cost of maintenance of electrical equipment per motor car per year ranges from $34.16 up to $204.34 with an average of $107.20. The wide variation is owing to the condition in which the motors are kept, and also the service in which they are employed. The average cost of maintenance for electric equipment of cars per car-mile is only 0.580 cent, which is only 4.33 per cent of the total cost of operation; this includes the maintenance of electric heaters and electric lights. The cost of operation of power plants per car-mile varies from 1.173 to 3.830 cents, with an average of 2.277 cents. The records show that only 2½ to 3 per cent of the trucks of electric cars are out of service for heavy repairs, but this is not the controlling feature of the availability of the equipment for service, as from 5 to 6 per cent of the car bodies are usually out of service for painting and varnishing. The practice is, therefore, to have 2 or 3 per cent more car bodies than trucks. The records of maintenance of overhead electric line per mile per year show an average of $149 for 18 different roads. Concerning reliability of service it is said that the records of a large elevated railway show only one-third as many delays to service owing to failure of equipment since electricity was adopted as there were when operating with steam. These records refer to actual number of delays and do not take into consideration

an increase of more than 20 per cent in the number of trains operated. Concerning the coal consumption, data by Stillwell are mentioned, according to which 4.3 pounds per kw-hour or 3 pounds per hp-hour at the draw-bar represent the coal consumption on the Manhattan Elevated. A road with heavy traffic and a large and efficient central power station should use only one-half as much coal as one using steam locomotives, and this may even be reduced under favorable conditions to one-third. The direct-current system cannot meet all the demands of heavy trunk line railway service. It should not, therefore, be installed on suburban lines, as any system introduced for this service should be one which can be extended to meet the requirements of all classes of service. This system, in addition to placing a limit on the voltage, requires the use of a third-rail conductor for heavy service. The third rail gives excellent satisfaction on elevated railways, while otherwise the overhead conductor is preferable. For high voltages the catenary suspension cable has been introduced.—*St. R'y Jour.*, May 27; *Eng'ing News*, June 1.

*How to Make an Electric Buckboard.*—BROCKSMITH.—An illustrated article with working drawings on the construction of an electric vehicle of the buckboard type. Full instructions for making the running gear are included in the article.—*Am. Elec.*, June, 1905.

### INSTALLATIONS, SYSTEMS AND APPLIANCES.

*Efficiency of Switches and Switchboards.*—BOJE.—An account of an extended series of tests. The station contained two 80-kw, direct-current dynamos, one of 160 kw and two storage batteries each of 600 amp-hours. The mean current of the machines and batteries during one year was carefully determined and the efficiency of the switches and the switchboards was then calculated for this mean current. The total energy given out during one year from the switchboard was 298,546 kw-hours, the loss in the switchboard 2,404 kw-hours; hence the efficiency was 99.2 per cent. While this efficiency is high, yet the selling price of the energy lost during one year in the switchboard represents 20 per cent of the first cost of the switchboard. The author discusses means for decreasing this loss. He recommends strongly not to use ordinary electromagnetic measuring instruments in switchboards, but to install precision instruments in spite of their higher cost, since the saving due to the decreased loss in only two years compensates for the higher cost. A great many experiments were made on the loss in movable contact surfaces. Fifteen different lubricating materials were tested and it was found that a certain fat which conducts the electric current reduced the losses in the contacts by 50 to 60 per cent. Other fats were not as good and some materials tested, like stearin, tallow, graphite, increased the contact losses. It is, therefore, recommended to lubricate the movable contact surfaces very slightly with a suitable fat. Stationary contact surfaces, for instance bus-bar connections, etc., also showed considerable losses. From a great number of tests with various thin plates placed between the two contact surfaces it was found that the contact loss can be slightly reduced by a thin sheet of tin-foil of 0.02 mm. thickness or of copper of 0.04 mm. thickness.—*Elek. Neu. Anz.*, May 15.

*Stand-by Charges and Motor-Load Development.*—An account of a long discussion held before the British Institution of Electrical Engineers, dealing mainly with the problem of securing a good motor load. The discussion was introduced by a paper of Taylor, who advocated a "restricted hour" system, power being sold at extremely low rates on the basis of the current being cut off during peak hours. The author thinks that in any provincial English town it would be perfectly safe to offer very low rates for power at restricted hours without any danger of a day fog causing the lighting to be shut down; even in London the system could be worked at the same rates if due precautions were taken to protect the lighting. The speakers in the discussion did not seem to think that the restricted hour system could be relied upon as a means of developing a really large motor load. It is only in the case of large motors that the restricted hour system may be beneficial to any extent. Part of the discussion dealt with the diversity factor which is found by dividing the sum of the maximum demands of all the consumers by the actual maximum demand on the feeders. While this is the recognized definition, it might be suggested that a truer definition would be the ratio between the sum of the maximum demands of all the consuming devices and the maximum load on the station, but in ordinary circumstances sufficient data would not be available to determine this. But on either basis it was generally agreed that Taylor's figure of 1.5 is far too low, and Tapper said that he was actually working with a diversity factor of 4.4 at Stepney. "At all events, the advocates of cheap power supply have a powerful argument in the diversity factor, and the most careful calculations which do not take this item into account make it seem impossible to supply motors at a price that would really be remunerative." The subject is also discussed in an editorial on this subject and a letter by Taylor on the diversity factor.—Lond. *Elec.*, May 12. A further letter by Taylor on the diversity factor is found in Lond. *Elec.*, May 19.

*Motor Hiring.*—WEST.—An article on the importance of increasing the motor load of stations and the advisability of a motor hiring department. He gives notes on the control of such a department.—Lond. *Elec. Rev.*, May 12.

### ELECTROPHYSICS AND MAGNETISM.

*Magnetic and Electric Properties of Sheet Steel and Steel Castings.*—DILLNER AND ENSTRÖM.—An account of researches made at the testing institution of the Technical University of Stockholm. As is well known, an increase of the carbon percentage implies a corresponding increase of the coercive force and also of the hysteresis energy loss. These facts have been found to be very distinctly borne out by the figures obtained for the sheet metal. The increase of the coercive force and the Steinmetz hysteresis coefficient have been found to follow a straight line within the range of a carbon percentage of 0.5 per cent. Thus it is obvious that a small amount of carbon is favorable in sheets used in armature cores and transformers. As regards the cast steel, however, it seems as if there ought not to be any inconvenience whatever involved in the increase of the carbon percentage, so far as is shown by the present researches. With the very highest percentage met with in the cast steel employed (carbon = about 0.30 per cent), the values of the maximum induction and of the permeability at the normal induction usual in field poles, cannot but be considered as quite satisfactory, while on the other hand the hysteresis properties of the pole material are comparatively unimportant. A high percentage of carbon also produces an increase in the electrical resistance, an effect which must be considered advantageous. An increase of silicon has been found to be accompanied by quite a noticeable increase of the coercive force and of the hysteresis energy loss, while the maximum induction seems not to be influenced to any noteworthy extent. For sheet steel any addition of silicon should be avoided on account of the increased hysteresis loss. On the other hand, with cast steel, the electric resistance is quite noticeably increased by the addition of some silicon (below 2 per cent), while the properties of permeability, remanence and maximum induction hardly undergo any alteration. An addition of aluminum quite noticeably reduces the hysteresis loss, while it increases the electric resistance, and thus reduces at the same time the eddy-current loss. It also reduces the maximum induction and the permeability for ordinary saturation values. The general conclusion is, therefore, that an addition of aluminum improves sheet material which is to be used for constructing dynamos. As regards cast steel, the matter is different. With such a high percentage of aluminum as is required in order to increase the electric resistance to an effective degree, the magnetic properties will be too much affected, and it must be agreed that the usefulness of aluminum in cast steel is questionable, to say the least. It is of interest, however, to notice the results obtained from the researches on cast-steel rods containing both silicon and aluminum. In this case low hysteresis losses are found, to be ascribed, no doubt, to the influence of aluminum, while the influence of this element on the permeability and maximum induction seems to be neutralized by the addition of silicon. The addition of silicon and aluminum together seems thus to tend toward a general improvement of the magnetic properties. Concerning soft steels it seems that Bessemer steel has a lower magnetic quality than open-hearth steel. On comparing basic and acid open-hearth steel, the basic steel has been found to be preferable and scarcely inferior to Lancashire iron.—Lond. *Elec.*, May 19.

*Brush Discharges and Ionic Mobilities.*—PRZIBRAN.—The author has formerly called attention to a relation between ionic mobilities and brush discharges in gases: the positive discharge prevails over the negative one the more in its dimensions, the greater the mobility of the negative ion compared with that of the positive ion in the gas. He now shows that the same relation holds good in liquids which are poor conductors.—*Phys. Zeit.*, May 1.

*Performance of Different Types of Electromagnet.*—Underhill.—An illustrated article on electromagnetic phenomena treated from a general standpoint and showing the relations between the types of electromagnet in common use.—*Am. Elec.*, June, 1905.

### Electrochemistry and Batteries.

*Electrometallurgy in Norway.*—A statement that during the first 11 months of 1904 the amount of metallic zinc exported from the factory of Hafslund, where the De Laval electrical process is employed, reached 1,316 tons. A large new plant for the separation of iron ore at Dunderlandsdal is nearing completion. The electric power station of 6,000 hp is ready, and it is hoped that by the summer of the present year some 5,000 tons of ore will be treated every day, while the exportation for 1906 is expected to reach 750,000 tons.—Lond. *Elec. Rev.*, May 12. Some editorial notes on the electrometallurgy of zinc, with special reference to the De Laval process, are given in *Electrochem. and Met. Ind.*, June.

*Electric Furnace.*—Harker.—A description of a laboratory electric furnace using a tube of the material of the Nernst lamp filament as heating resistance. This is surrounded by a jacket of pure circonia powder, which again is surrounded by a fire clay tube kept at 1,000° C. by means of a heating coil of nickel. The temperature in the furnace can be strictly controlled up to 2,000° C. The melting point of platinum was determined in this furnace and found to be 1,710° C. within five degrees.—Lond. *Elec.*, May 19; from a paper read before the Royal Society, April 13.

*Storage Batteries.*—In a continuation of the catechism of electricity, the principles of secondary battery cells are dealt with.—*Power*, May.

### Units, Measurements and Instruments.

*Motor Meter with Permanent Magnet for Direct Current.*—An official statement of the Reichsanstalt concerning the admission for calibration of a motor meter with permanent magnet for direct current made by the Allgemeine Elektricitäts Gesellschaft for currents from 2 to 20 amp. at voltages up to 600 volts for two-wire systems only. This meter is built in three different forms: one form gives the kilowatt-hours at a fixed supply voltage; a second form gives the ampere-hours; a third form gives the kilowatt-hours at the voltage indicated by the needle on a special dial. The principle of the construction of three forms is the same and is shown in Fig. 2. In

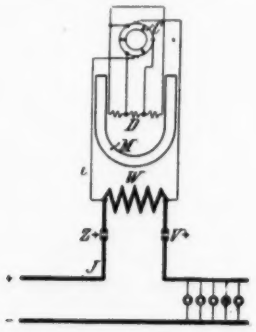


FIG. 2.—MOTOR METER.

parallel with a resistance, $W$, in the main circuit, there is the armature of a motor, $C$, which revolves in the field of a permanent magnet, $M$. The main current, $J$, divides itself into two parts in the meter, one passing through the resistance, $W$, the other, $i$, passing through the armature with the resistance, $w$. When the current passes the armature assumes a speed, $u$, under the action of the magnetic field. This produces in it the electric counter e.m.f., $Eu$. The armature wires are wound on an aluminum drum in which eddy currents are generated, which produce a mechanical force counteracting the rotation. On account of this counterforce, which is proportional to the speed, the power, $Bu^2$, is consumed. The friction resistance, $R$, also counteracts the revolution of the armature and consumes an amount of power equal to $Ru$. Mathematical analysis shows that the speed of the revolution of the armature is proportional to the main current, $J$, as long as $R\ (W + w)$ is negligibly small compared with $J\,W\,E$.—*Elek. Zeit.*, May 18.

*Wattless Current Meter.*—An illustrated description of a Ferranti wattless current meter. It measures $V\,C\ sin\ \alpha$, where $V$ = virtual volts between phases, $C$ = virtual current in one phase, and $\alpha$ = the angle of lag. At any given normal voltage, therefore, it can be calibrated in terms of $C\ sin\ \alpha$, i. e., in terms of the wattless current in the circuit. The internal construction of this new instrument is the same as that of Ferranti's wattmeter. Fig. 3A shows the connections for a wattmeter on a three-phase balanced circuit, while

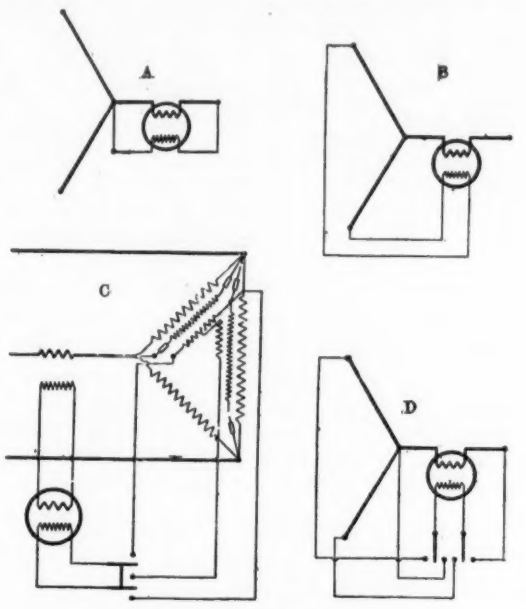



FIG. 3.—WATTLESS METER.

Fig. 3B shows the instrument connected up as a wattless power meter. In this case the current coil is connected in series with one phase and the potential coil is connected across the two remaining phases. By this arrangement the currents flowing in the current and potential coils respectively are displaced in phase by 90°. The instrument now reads the wattless component of the power. It is calibrated with a central zero, and indicates whether the current is leading or lagging. There are also supplied instruments whose object is to combine a wattless power meter with a wattmeter, in which case the diagram of connections is as shown in Fig. 3D. In this diagram the potential transformers have been omitted for the sake of clearness. There is a double-throw switch, and when this is connected to the one set of contacts the instrument is connected as a wattmeter, and when the switch is thrown to the other set, the instrument is connected as a wattless power meter. The switch usually employed is of a spring-key pattern, the instrument being normally connected up as a wattmeter. If the attendant desires to ascertain the wattless power in the circuit, he simply presses the key. This combined instrument is provided with two scales, one marked leading and lagging, and calibrated in wattless amperes, the other one, the wattmeter scale, being calibrated in kilowatts. Fig. 3C shows the combined instrument complete with current and potential transformers for a balanced three-wire circuit. It will be noticed that the potential transformers are connected up in such a way that when the instrument is employed as a wattmeter the potential supply is in phase with the current in the current coil, and when the instrument is used as a wattless current meter, the potential supply is in quadrature to the current in the current coil.—Lond. *Elec.*, May 19.

*Phasemeter.*—Boehm-Raffay.—A description of a phasemeter devised by Bruger. It consists essentially of a double wattmeter, as

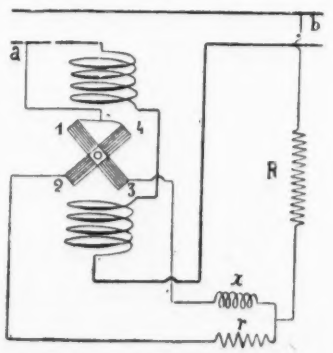



FIG. 4.—PHASEMETER.

shown in Fig. 4. By means of two coils through which the main current flows, an alternating magnetic field is produced in which four coils of fine wire can revolve around a vertical axle. These four

coils are in a fixed position with respect to each other. The coils 1 and 2 in series with a non-inductive resistance, *r*, form one circuit, and the coils 3 and 4 in series with an inductance, *x*, form a second circuit. These two circuits are connected in parallel and this combination is in series with a large non-inductive resistance, *R*, and forms the voltage circuit of the phasemeter. The angle, *a*, of the deviation gives the angle of phase difference, *b*, according to the equation *tanz a = tang b*. Some notes of Sartori on the theory of the instruments are given. It is shown that the instrument is independent of the strength of the main current or the e.m.f. It depends, however, on the frequency, since the inductance, *x*, depends on the frequency. For this reason the instruments are supplied with an adjustable auxiliary resistance by means of which the correction for variation in frequency may be made. For switchboards the instrument is designed directly for the frequency of the installation.—*Elek. Neu. Anz.*, May 15.

*Torsion Meter.*—A long illustrated description of the torsion indicator of Denny & Johnson, by means of which the torsion of a revolving shaft may be easily ascertained, thus enabling the horsepower transmitted to be accurately calculated. It is especially intended to be used in connection with steam turbines. Fig. 5 shows

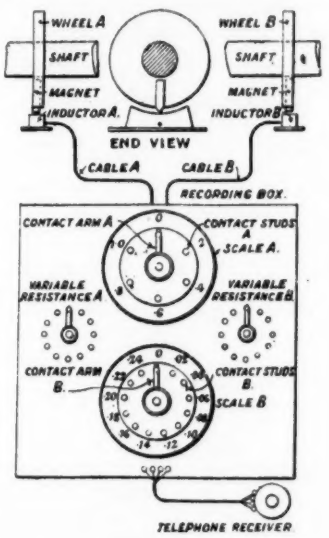



FIG. 5.—TORSION METER.

the general arrangement of the apparatus. On the shaft, the torsion of which it is desired to measure, are fixed at a suitable distance apart two light gun metal wheels, *A* and *B*. On each wheel is mounted a permanent magnet, the projecting pole of which is made V-shaped in order to produce a dense and definite magnetic field at the point. Underneath the magnets, and set concentrically with the wheels and shaft, are fixed two inductors, *A* and *B*, each of which consists of a quadrant-shaped piece of soft iron carried on a gun metal stand provided with suitable leveling screws. On each piece of iron are mounted a number of separate but similar windings of insulated wire. There is in connection with the inductors a recording box, in which are mounted two series, *A* and *B*, of contact studs, around which are fixed scales. In connection with the series of studs are arranged two contact arms, *A* and *B*, by means of which electrical connection may be made at will between any desired stud of a series and its contact arm. When the shaft rotates without transmitting power, a current is produced in the end or zero winding of each inductor, the contact arms being first placed in contact with the end or zero stud in each series. These two separate currents each traverse their respective circuits, passing in each case from the inductor winding, in which they are produced, to the respective zero studs, to which these windings are connected, thence by way of the respective contact arms, resistances and telephone receiver windings back to the inductors again. The connections to the telephone receiver windings are so arranged that the effects of the two separate currents flowing therein are in opposition, and thus neutralize each other's effect on the receiver when the strengths of the two currents flowing are exactly equal at the same instant. By means of the variable resistances in each of the circuits the currents are made equal in strength. When transmitting power the shaft is subject to a certain torsion or twist, which causes the zero winding of the inductor next to the turbine or engine to be excited in advance of the other by the amount of the torsion of the shaft. A loud ticking sound will then be heard in the receiver, as the currents no longer neutralize each other. Contact arm *B* is then shifted from stud to stud until the position of least noise in the receiver is once more obtained. When this position is found the reading on the scale *B* opposite the contact arm represents the circumferential measurement of the angle of torsion of the shaft at the radius of the inductor windings.—Lond. *Elec. Eng.*, May 19.

*Electrolytic Meter.*—A fully illustrated description of the electrolytic mercury meter of Wright.—*L'Industrie Elec.*, May 10.

*Testing Lightning Rods.*—An illustrated description of a bridge for testing lightning rods.—*Zeit. f. Beleucht.*, May 20.

## TELEGRAPHY, TELEPHONY AND SIGNALS.

*Telephone Traffic.*—WEBB.—A paper read before the British Institution of Electrical Engineers. The author emphasizes that the gain of a second or of a fraction of a second on an operation many times repeated each day has, in a large telephone system, a cash value running into handsome figures. He points out that the use of lamp signals now enables many things to be done which were impossible before. He gives very exact data based on observations made in commercial practice (in New York) and illustrated by diagrams, on the average time occupied in the various space of a connection between one direct line and another line for magneto working, compared with the modern standard relay system. It is seen that the time spent in operating the average connection with standard apparatus is just a third of the time occupied with magnetic apparatus; in trunk connections the gain is even greater, the time spent in operating the average connection with standard apparatus being less than a quarter the average time with magneto apparatus. These figures indicate that with the apparatus of to-day the operator should be able to do from three to four times the amount of useful work—that is, handle three to four times the number of calls in a day—that she was able to cope with 10 or 12 years ago. It is difficult to give exact figures from actual practice, but the author mentions one instance illustrating a very substantial gain in economy. It is an exchange which formerly contained a magneto equipment for 5,200 lines. The present switchboard equipment of standard apparatus is contained in a room of exactly the same size as the former room—indeed, built over it—and has a capacity of 9,600 lines. In the present switchboard the answering positions occupy about three-quarters of the space formerly occupied by the answering positions of the old board, whereas the incoming trunk positions, though they are more economical, occupy more than twice the space formerly required for incoming junctions, so great has been the increase in the amount of trunk traffic. The gain in the efficiency of the telephone connection would be much less than it is, if the introduction of accurate and automatic apparatus had not been accompanied by the adoption of systematic methods of instructing and training operators, of supervising their work and of continuously observing and testing the service. The preliminary training of operators is a most important point in a large and complicated system. The constant observation of the traffic is the measure which has contributed most to the effective use of modern apparatus, and to the attainment of a high standard of efficiency and accuracy in the operation of a large daily volume of telephone traffic. It is only by making continuous tests on a certain proportion of the daily traffic, noting not only the time of every step, but the method and manner of conducting every part of the operation, that sufficient information can be gained of operations involving so much detail, to enable defective methods of operating to be eliminated or checked, and suggestions to be evolved tending to a general increase of efficiency. Some idea of the complexity of telephone traffic may be had from the fact that the printed form for recording these service observations contains 42 columns, each with its appropriate heading.—Lond. *Elec.*, May 12. A full account of the discussion which followed the paper is given in Lond. *Elec.*, May 19.

## MISCELLANEOUS.

*Egypt.*—Some statistical notes on the electrical industries of Egypt. There is electric light in private houses and electric traction in Cairo and Alexandria. Electric lights are also installed at Port Said, Tantah, Mansurah, Ismialiah and Suez. The imports of electric machinery in the last four years are given as follows:

| | 1901. | 1902. | 1903. | 1904. |
|---|---|---|---|---|
| Total | $209,255 | $276,215 | $338,470 | $467,760 |
| From U. S. | 335 | 6,025 | 2,585 | 25,855 |

The first line represents the value of the total imports into Egypt, the second line the imports from the United States. While the imports from the United States were the smallest ones out of nine countries in 1901, it was in the fourth place in 1904. Most of the machinery is imported from England. It is thought that gas engines have a bright future in Egypt, also electric power transmission for irrigation purposes as well as in cities. Fans are used to some extent, but competition has resulted in very low prices. There are no laws regulating the electric installations. In many cases the cheapest material is preferred.—*Elek. Anz.*, May 21.

*Exposition.*—Brief illustrated descriptions of exhibits at the annual exposition of the French Physical Society. Some of the instruments and apparatus described in the present installment are hot wire ammeters and voltmeters of Breguet, non-periodic ammeters and voltmeters à cadre mobile of Breguet, Fery's optic pyrometer and the registering type of this instrument, various meters of Aaron, among them an induction meter for three-phase systems, a meter for tramway purposes, a meter for indicating the maximum consumption of a subscriber, also double-tariff meters.—*L'Industrie Elec.*, May 10.

## Step-Bearings of Curtis Steam Turbine.

The general features of the Curtis turbine have frequently been discussed in these columns and comprehensive articles descriptive of the machines may be found in our issues for April 11 and May 23, 1903. As is well known, a prominent feature of the mechanical design of the machine resides in the use of a vertical shaft. The numerous advantages claimed for this method of construction have previously been given and need not be restated. It is evident, however, that the bearing which must carry the total weight of the revolving part has presented many problems which were new in the construction of such machinery. It is believed, therefore, that a description of the design of this bearing will be of interest.

A vertical section through the bearing as used in some of the Curtis turbines recently completed by the American manufacturer is shown in Fig. 1. It consists of two cast-iron blocks, one of which is secured to the lower end of the vertical shaft, and the other of which, although stationary for each adjustment, is designed so that it may be moved up and down by a screw driven by means of a worm gearing. The central portion of the two blocks is cut away, and into the space thus formed there is forced oil at a pressure sufficient to separate the two blocks and allow a thin film of oil to form the friction surfaces between them. The oil passes gradually outward

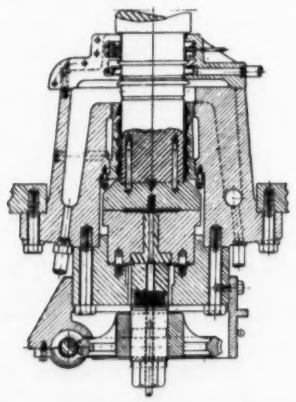


FIG. 1.—VERTICAL SECTION OF BEARING.

and upward, and, after lubricating the side guide bearings, it flows back to the pump. It is stated that about five gallons of oil passes per minute in a 5,000-kw machine.

It was appreciated initially that the step-bearing would cut immediately when the lubrication was stopped, and in the early designs precautions were taken to supply accumulators for maintaining the pressure of the oil in event of the stoppage of the pump. Experience has shown, however, that the character of the metal of the bearing is such that the stoppages of oil do not cause an interruption of service. The metal is removed very slowly, and the surface quickly becomes smooth when the flow of oil is again established. In the late designs there is provided a powerful brake which bears on the lower surface of a chilled iron ring carried by the lower wheel. This brake is in a position to receive the revolving part in case the step-bearing support should fail. In normal operation it serves for stopping the machine quickly when desired.

In Fig. 2 is shown a part sectional elevation of the lower part of a Curtis turbine as manufactured at the British Thomson-Houston Company's factory at Rugby, England. From this figure may be

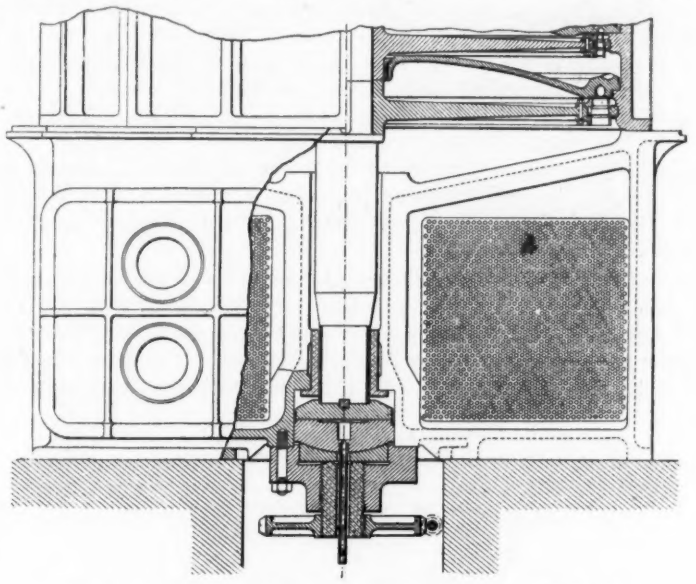


FIG. 2.—PART-SECTIONAL ELEVATION OF LOWER PORTION OF FOUR-STAGE TURBINE.

clearly seen the arrangement of the diaphragms, moving blades and fixed blades, as well as the position of the condenser and details of the step bearing, which is one of the most interesting features of the turbine. The bearing differs slightly in details from that shown in Fig. 1. Water is forced through a hole in the stationary part and slightly lifts the upper surface and the whole rotating part of the turbine, a thin film of water remaining between the two surfaces. From this bearing the water passes upward and lubricates the guide bearing immediately above, and thence passes into the turbine base, whence it is removed with the condensed steam. A small pressure pump and hydraulic accumulator maintain the water supply to the step bearing, the power required for this purpose being about 1 hp for each 750 kw capacity of the turbine. When the bearing becomes worn the lower surface can be lifted by means of the screw beneath the bottom block, which is worked by a hand wheel through a worm gear, as indicated in Fig. 2. All the bearings are removable without disturbing the turbine or the generator. The lower block of the step bearing and the lower guide bearing can be lowered into the pit below, the middle guide bearing is split and can be removed sidewise, while the upper bearing can be lifted out from above.

## Large Electrically-Driven Planer.

An example of the excellent work being done in the machine tool electric drive is afforded in the accompanying illustration, showing a 36-in. by 36-in. by 12-ft. Pond Planer, electrically equipped by the Electric Controller & Supply Company, of Cleveland, Ohio. Formerly in applying the electric drive to machine tools a motor was often fitted to a machine in any way that would make a driving connection, regardless of other important considerations involving convenience and efficiency in operation. In the design of the present system of equipment, every factor entering into the problem of the electric machine tool drive was given careful study, the object being to adapt the electric equipment perfectly to every condition of machine tool operation.

The illustration shows the motor geared to the planer cross shaft, the accelerating board just beyond the motor, a small speed controller on the housing convenient to the operator, and a reversing switch with its shifter handle actuated by the dogs on the platen. Variations of cutting speed through a range of two and one-half to one are obtained with single-voltage, direct current, and of five to one with two-voltage, direct current, with corresponding ratios for the various multi-voltage systems.

The drive here shown can be applied to any planer, old or new,

does away with all bents or clutches and makes possible an increase in output of from 50 to 200 per cent over the regular belt-driven planer.

It is evident that to get maximum output from a planer, as from

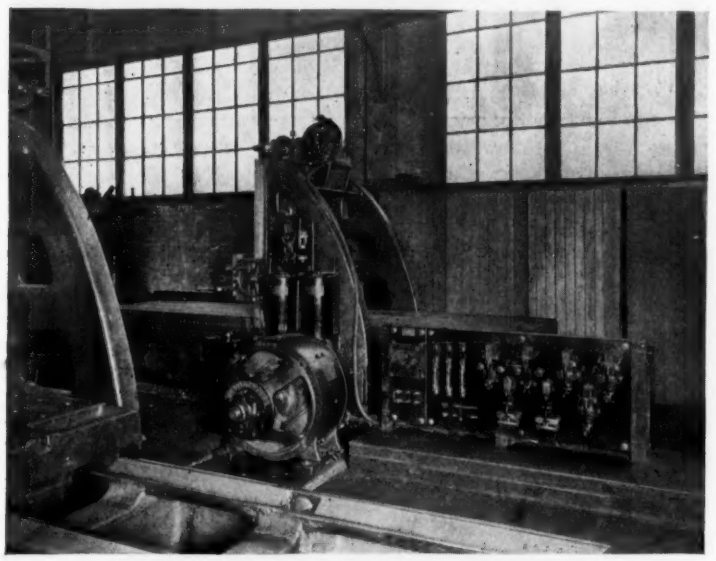


FIG. 1.—PLANER DRIVEN BY DIRECT-CONNECTED VARIABLE-SPEED MOTOR, SHOWING DETAILS OF CONTROLLERS.

other tools, there must be a wide range of cutting speeds in small steps from the lowest to the highest. This has been accomplished by gearing the variable-speed motor direct to the driving shaft, and by means of a reversing switch, operated by dogs adjustably mounted on the platen of the planer, working in conjunction with a set of stopping and accelerating switches, the motion of the motor is reversed at either end of the stroke. The operation of the controller is such that the driving motor will reverse and accelerate the platen

FIG. 2.—PLANER DRIVEN BY DIRECT-CONNECTED VARIABLE-SPEED MOTOR.

of the planer just as rapidly as is consistent with the power of the motor. The maximum current which can flow to the motor is absolutely limited, so that there is no sparking or undue mechanical straining at the instant of reversal.

The speed controller is provided with a marked dial showing the cutting speed. To obtain the desired speed it is simply necessary to turn the handle to the proper notch, and this can be changed at will without stopping the planer if it is desired to increase or decrease the speed. A similar speed controller for the return stroke can also be applied.

The platen may be reversed by hand for setting up work and for adjusting the dogs for proper length of stroke. A shifter lever attached to the reversing switch is used for this purpose and the operator can stop the planer instantly by putting it in the central position.

## Typo-Telegraph.

An interesting development in rapid printing telegraphy by the selective principle as against the synchronous or step-by-step principle is found in the typo-telegraph system, illustrated herewith, which was invented by Dr. George A. Cardwell, of New York. This system is one employing simplex or duplex working, at speeds equal to that of the ordinary typewriter, and is entirely automatic except for the keyboard operator who sends the message.

The selective scheme is based on the number of permutations of four things, taken three at a time. The transmission of a character, or the execution of a distant function, is performed by executing three or four possible functions in the proper order.

The keyboard from which the impulses are sent is of the universal type, and is arranged to close the local circuits of a series of magnets, which in turn transmit the line impulses. The impulses are of the same length, with equal intervals between the three impulses; the lengths of impulse and interval are controlled by interposing a series

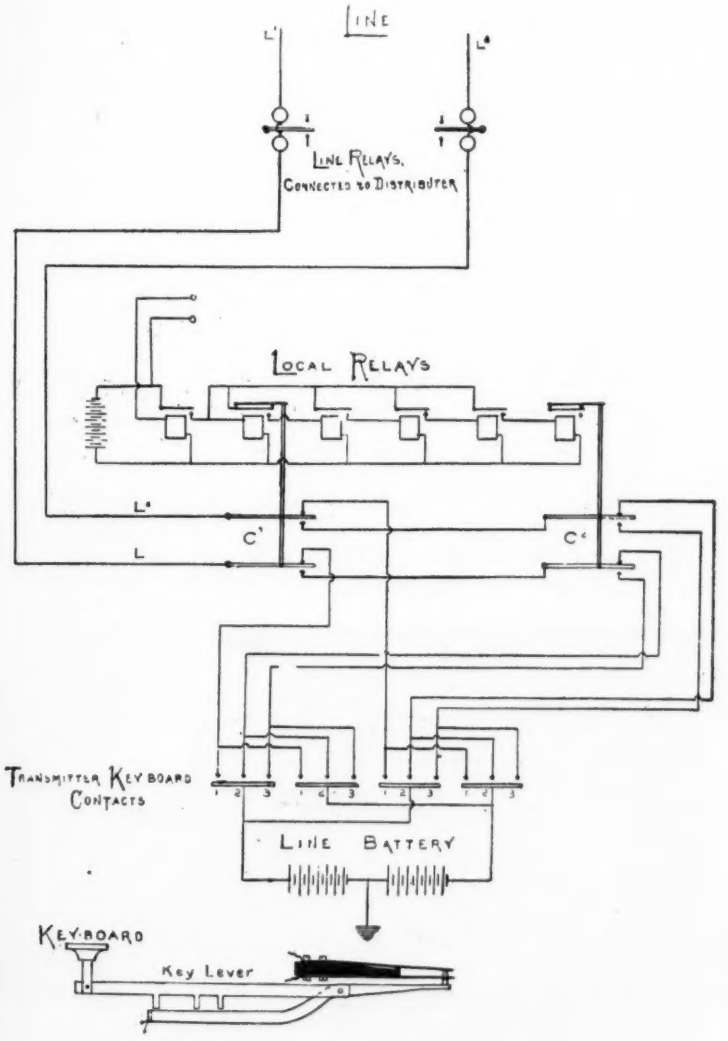



FIG. 1.—THE TRANSMITTER.

of local relays in the transmitting circuit, each of which energizes the next, etc., the last one closing the line circuit.

A general view of one complete station is shown in Fig 3. In this photograph the covers have been removed to show the working parts. In the left foreground is the transmitting keyboard; at the right are two polar line relays; in the middle background is the distributor, which selectively permutes the local printing circuits; directly above the distributor is the printer.

The three essential groups into which the mechanism may be divided are the keyboard transmitter, the distributor and the printer. The home record of transmission is obtained from the home line relays, which in turn operate the home distributor and the printer, and therefore it is possible to "break" the sending, from the distant receiving station, and the home record shows that the line is oper-

ating properly. Further than this, the combination of local locking relays in the transmitting circuit is unlocked only when the home printer is executing its record of the transmitted signal.

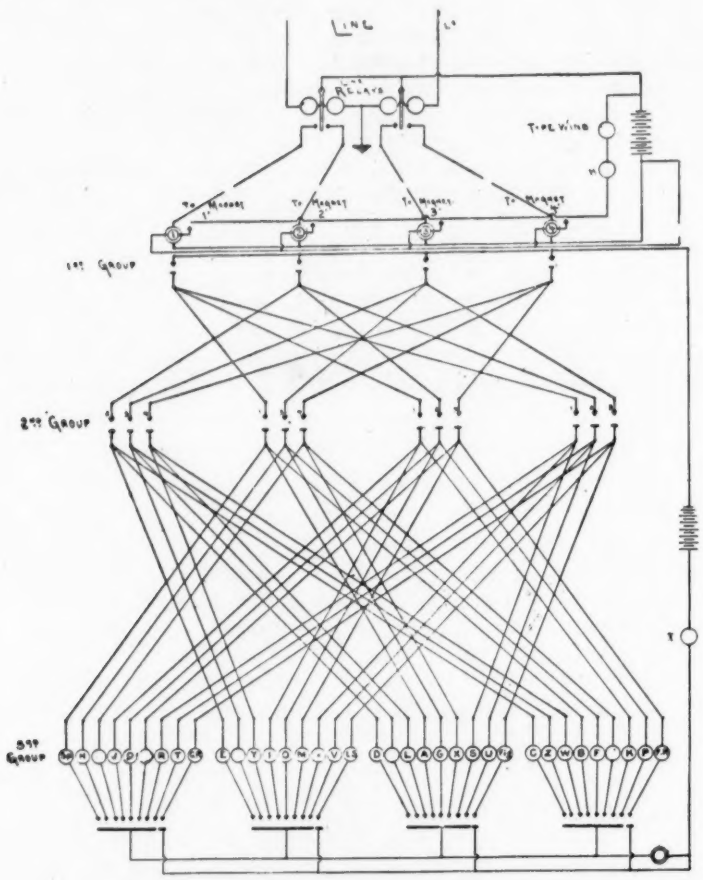



FIG. 2.—THE DISTRIBUTOR.

The principles and the circuits of the transmitter are illustrated in Fig. 1. The keyboard contains thirty-two keys, of which twenty-seven are for printed characters, the remaining five being the "spacing," "line space," "carriage return," "shift to figures" and "release."

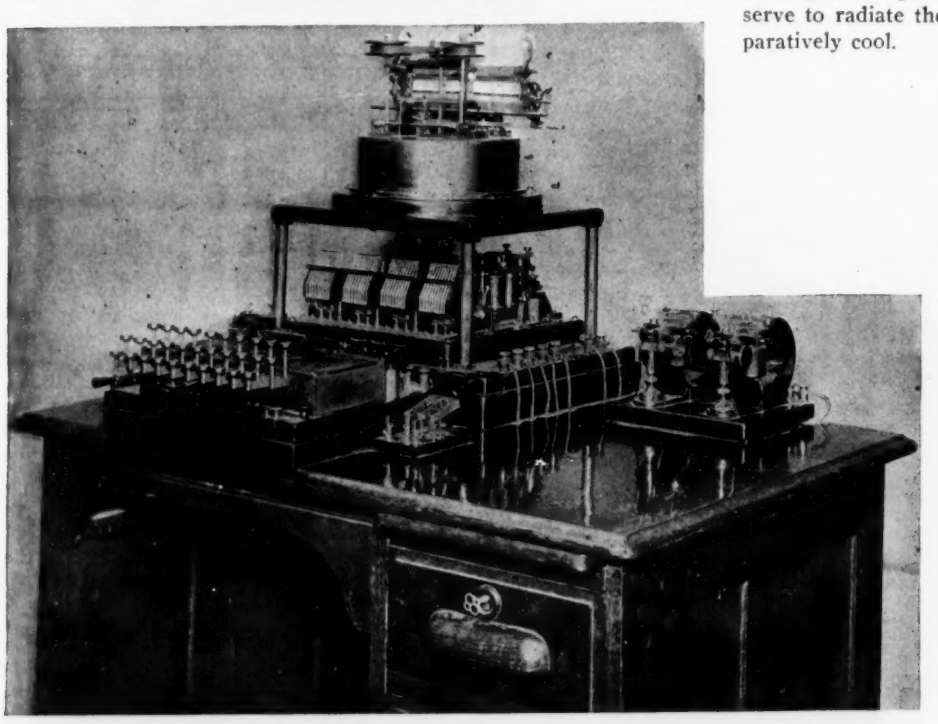


FIG. 3.—COMPLETE STATION.

Each key lever is arranged to depress three of twelve bars, as shown in the figure; each bar closes a single contact. The six local relays are arranged to control the interval between the impulses, as well as the length of impulses; there may be more or less than six of these relays, according to the desired speed.

The distributor circuits are shown in Fig. 2; the locally permuted printing circuits are shown in full, although some of the auxiliary relay circuits and contacts have been omitted in order to show the principle more clearly. The polar line relays and their line connections are shown at the top of the figure. The process of selective permutation involves three consecutive steps, and upon the completion of the third step the permutation is completed, and a selected circuit, containing battery, is closed, while the function corresponding to the combination of three-line impulses, is duly executed.

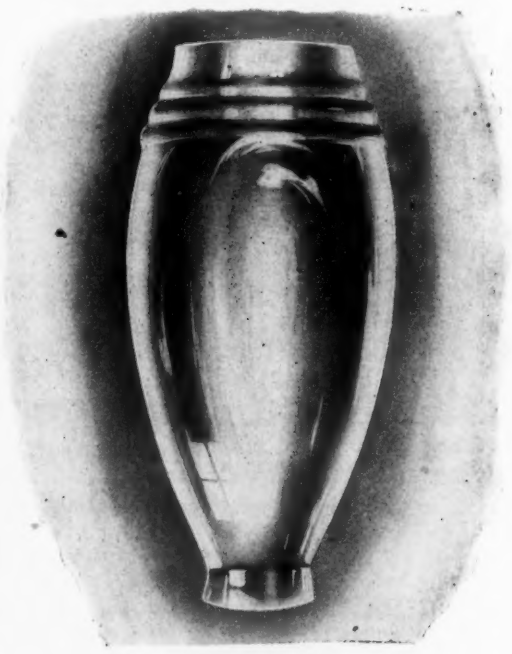
A series of very interesting tests has recently been conducted on the wires of the American Telephone & Telegraph Company. These tests were made over composited circuits from New York to Boston and return. The system was highly successful in this respect, and simultaneous telephony and printing telegraphy was practically demonstrated, without interference with the telephone.

## Non-Collapsible Inner Globe.

A difficulty which has been experienced with the use of inner globes on enclosed arc lamps has been found in the sagging of the top of the globes due to the softening of the glass. This softening is a feature of the glass which develops more or less rapidly according to the temperature to which it is subjected, so that the "life" of the globe is largely dependent upon the operating temperature. If the temperature is kept below a certain maximum, whose value depends upon the composition of the glass, the "life" of the globe is unlimited.

The temperature at which the globe will operate depends upon the amount of heat which must be transmitted through the glass and inversely upon the surface from which this heat can be radiated. Since glass is an extremely poor conductor of heat, the method of stiffening the globe by increasing the thickness of the glass is not productive of the desired result when the inner surface of the globe is subjected to a high temperature, on account of the fact that the heat is transmitted through the glass at a rate so slow that the temperature rise is unduly increased.

In the accompanying illustration is shown a method of providing initial stiffness to the globe and at the same time insuring that the temperature rise will be below that value destructive to the "life" of the globe. Without appreciably increasing the thickness of the glass the outer surface of the globe at the point where the temperature is the highest is provided with rings of large superficial area, which serve to radiate the heat at a rate sufficient to keep the globe comparatively cool.

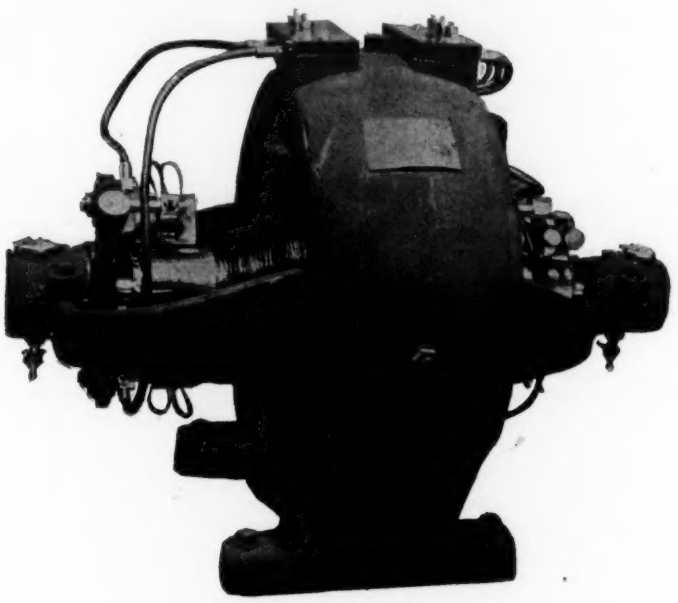


NON-COLLAPSIBLE INNER GLOBE.

There has been little change in the make-up and form of inner globes since the first appearance of the enclosed arc. This new globe seems to mark an important advance in the mechanical side of the enclosed arc industry. It is manufactured by the Libbey Glass Company, Toledo, Ohio.

## Dynamotor for Röntgen Ray Work.

The dynamotor illustrated herewith represents a peculiarly handy machine for charging storage batteries or such other purposes as may require the transformation of direct currents from one voltage to another. As will be noticed, it is of the cradle type, the armature being mounted in a yoke or cradle entirely independent of the field frame, and removable therefrom without disturbing the bearings. Owing to this peculiarity of construction the machine can, of course,



DYNAMOTOR.

be assembled for support either on the floor or from the wall or ceiling; and has the advantage over other bracket type constructions that it is impossible for the bearings to get out of alignment when changing from the one form of support to the other.

The particular machine illustrated was designed for the operation of a large X-ray outfit, and is intended to deliver 30 amp. at 110 volts on the low-pressure or secondary side, using 220-volt current at the primary.

The New England Motor Company, of Lowell, Mass., manufactures a complete line of these dynamotors for charging automobiles, running X-ray outfits, etc.

## Automatic Numbering Machine.

The accompanying illustration shows the latest model of Bates automatic numbering machine, made by the Bates Machine Company, 346 Broadway, N. Y. Instead of the customary iron or brass frames and brass cases, all metal parts are made of steel, contributing rigidity and strength with minimum weight. It is only necessary to move the indicator until the word representing the class of numbering desired appears in the window of the front plate. When set "Consecutive" the number advanced from "1" to "999,999," changing all the wheels automatically. When set "Duplicate" each number is printed twice and is then advanced consecutively. When set "Repeat" the automatic mechanism is detached and the number is repeated continuously. The figures are deeply cut and finely proportioned. Being well spaced, they are absolutely legible, and large enough for practically all purposes, while condensed to occupy but a small space.

The wheels and ratchets are divided into equal tenths, thus assuring perfect accuracy of movement. "Drop-ciphers" with their springs and pins have been eliminated and the wheels themselves are made depressible to provide the necessary spaces preceding the unit wheel. The plunger, which is made of Bessemer steel, is shielded from view when in its normal position and does not present the unsightly appearance of the oiled brass plunger with the nickel partly peeled off, nor will the hands be soiled by contact with it.

All machines of this model are made with six wheels with a numerical capacity of from "1" to "999,999," and may be re-set to commence at any desired number. The frame is substantial, being made of drawn steel, ¼ in. thick and is finely finished and blued. Weighing only 14 ounces, it is capable of being operated noiselessly and

NUMBERING MACHINE.

with remarkable speed and accuracy. The figures are automatically inked before each impression, from a thick felt pad. The pad-holder may be instantly removed from the machine for re-inking. An accurate gauge plate assures printing precisely upon the line.

## Electric Light Convention Exhibits.

The exhibits at the Denver-Colorado Springs convention of the National Electric Light Association were very attractive and numerous, notwithstanding the great distance from the headquarters of most of the concerns thus represented. The display was truly a remarkable one and was in keeping with the wide, free spirit of the West, which knows no bounds. Below are given brief sketches of the exhibits.

ALLIS-CHALMERS COMPANY had made excellent preparations for being well represented at the convention. Eleven officials from the company were very much in evidence during the entire session. The list is as follows: O. A. Stranahan, manager power department, Milwaukee; M. C. Miller, executive department, Milwaukee; C. A. Tupper, publicity department, Milwaukee; J. R. Jeffrey, assistant secretary Bullock Electric Manufacturing Company, Cincinnati, Ohio; David Hall, assistant chief electrical engineer, Cincinnati; Louis E. Bogen, engineer electrical department, Cincinnati; George H. Berg, district office manager, Boston; George B. Foster, district office manager, Chicago; R. B. McConney, district office manager, Denver; H. L. Woolfenden, electrical department, Denver; R. J. Glendenning, assistant district office manager, Salt Lake, Utah. A large reception room was elaborately furnished, and carpeted with costly Navajo rugs, which elicited the admiration of the visitors, the center piece, an Indian representation of lightning, having taken five Navajos twenty months to weave. The walls were hung with framed photographs representing Bullock electrical apparatus and leading installations, and bulletins elaborating on these themes covered two large tables. The new Allis-Chalmers binders, which are so arranged as to permit the bulletins inserted to lie perfectly flat when opened, attracted considerable attention, and many of the visitors asked to have the binders furnished to them at their home addresses. Conveyances stood at the door of the hotel to take guests to the plant of the Denver Gas & Electric Company, where five Allis-Chalmers engines and the following Bullock apparatus are installed: Two 1,500-kw, three-phase, 60-cycle, direct-connected Bullock alternators; four 600-kw, three-phase, Bullock belted alternators; two 400-kw, Bullock direct-current belted generators. This is the largest electric generating plant between the Missouri River and the Pacific Coast, and visitors found it a model of its kind.

THE WESTINGHOUSE EXHIBIT.—The exhibit of the Westinghouse Companies, which adjoined the convention hall in the hotel, was unusually attractive on account of the decorations typical of the West. In the center of the room, on a pedestal surrounded by palms, was a cub bear holding in the right hand a Sawyer-Man incandescent lamp, and suspended from the ceiling, immediately over the bear, was a large eagle holding in its claws two of the "lumino" lamps of the Sawyer-Man Company. The display proper consisted

of a full line of the company's incandescent and arc lamps, lightning arresters, meters, transformers, circuit-breakers, small motors, etc. The headquarters of the Westinghouse Company were in a room near by. Here refreshments were served and a complete line of the literature descriptive of the company's apparatus distributed. The interior of the Brown Palace Hotel being open from the roof to the lobby and surrounded by circuitous balconies, made it possible to suspend from the center of the ceiling a "stringer" display sign, spelling from top to bottom, the name of the company. This sign was 100 ft. long and extended to within 20 ft. of the ground floor. This rendered it possible to see the sign from every point inside the hotel, making it a most effective advertisement. The Nernst Company had on exhibit a full line of its lamps at the Hotel Savoy. Mr. E. R. Roberts, of the Pittsburg office, was in charge. The Westinghouse Companies were represented at the convention by a large delegation which was brought out on a special car and consisted of the following: From the Westinghouse Electric & Manufacturing Company—C. S. Cook, manager of the railway and lighting department; C. B. Humphrey, manager detail and supply department; G. B. Griffin, manager of the same department; H. P. Davis, assistant chief engineer; W. C. Webster, assistant to the second vice-president; T. H. Bailey Whipple, general lamp agent; P. N. Jones, manager Denver district office; C. E. Skinner, Paul McGahan, K. C. Randal and Clarence Renshaw, engineers; S. A. Chase, of the New York sales office; W. R. Pinckard, of the Chicago district office; H. S. Sands, E. C. Means and B. S. Manuel, of the Denver district office. From Sawyer-Man Electric Company, Walter Cary, manager. From the Nernst Lamp Company—Max Harris, sales manager; S. Solomon and Mr. R. D. Marthens, district managers; E. R. Roberts, of the Pittsburg office; R. D. Marthens, manager Denver office. The Westinghouse Machine Company was represented by C. C. Chappell, manager of the Denver office. The arrangements were in charge of J. C. McQuiston, superintendent of the publishing department, and L. M. Cargo, the manager of the Denver office of the Westinghouse Electric & Manufacturing Company.

THE GENERAL ELECTRIC COMPANY'S representatives made their headquarters in a large parlor adjacent to the convention hall in the Brown Palace Hotel. This room was attractively furnished and decorated with Oriental rugs and palms. Although this was a convention of people interested in electric lighting, the delegates were quite generally interested in the photographs and descriptions of the new high-speed electric passenger locomotives which this company is building for the New York Central Railroad. The mercury arc rectifier exhibited by the General Electric Company was naturally of deep interest to the delegates. This device as shown is meeting a rapidly increasing demand for charging storage batteries, especially in electric vehicle service. Its recent adaptation to series arc lighting, particularly with magnetite and with mercury arc lamps for street lighting, gives it a peculiar value in the eyes of progressive central station men. As a souvenir the representatives of the company distributed a neat miniature frosted incandescent lamp mounted as a scarf pin. At Colorado Springs the General Electric Company was fortunate in having for its headquarters the famous "sun parlor" at The Antlers. Here the company's representatives from its various local offices were "at home" during the three days of the convention at the Springs. A list of the General Electric men present follows: General Irving Hale, manager Denver office; G. A. Woolley, supply manager Denver office; H. C. Glaze, sales dept.; C. P. Mahaffey, engineer, Denver office; J. V. Swanson, construction dept., Denver office; Robt. Tait, auditor, Denver office; E. E. Gilbert, lighting dept., Schenectady; A. D. Babson, supply manager, New York; M. D. Grosh, Salt Lake City; O. E. Turner, Dallas, Tex.; J. Scribner, lighting dept., Chicago; W. F. Smith, Minneapolis; J. H. Livsey, Detroit; P. D. Wagoner, Schenectady; H. W. Hillman, Schenectady; F. G. Vaughn, Schenectady; H. J. Buddy, Philadelphia; F. H. Gale, advertising dept., Schenectady; F. W. Wilcox, incandescent lamp dept., Harrison, N. J.; C. B. Burleigh, Boston; H. C. Houck, Cincinnati.

WARNER ARC LAMP COMPANY, Muncie, Ind., had a working exhibit of several types of its arc lamps, the merits of which were described to many central station men by Mr. W. F. Warner, who was in charge.

THE STANDARD PAINT COMPANY, of New York, showed in its parlor samples of Ruberoid roofing and its well-known P. & B. specialties, including insulating tape, electrical insulating compounds, armature and field coil varnish. Messrs. Earnshaw, of the company's Boston office, and Beckman, of Chicago, were in charge and distributed an attractive souvenir in the shape of a Russia leather mounted desk blotting pad, as well as the company's literature. A triangular sign of this company suspended in the lobby of the hotel attracted much attention.

THE PHELPS COMPANY, Detroit, displayed a variety of styles of Hylo lamps, Wynk signs in three styles and Wynk transparencies. Other features of its exhibit were Skeedoodle socket plugs, self-flashing lamps, Turn-up advertising lamps and a new specialty known as the Skeedoodle A, connected in series with and flashing a number of lamps simultaneously. Messrs. W. E. Phelps and J. W. Phelps were in charge of the exhibit.

THE SWITCHBOARD EQUIPMENT COMPANY, of Pittsburg, exhibited 400 amp., 250-volt and 75-amp., 250-volt circuit-breakers and a protected panel for use with motor circuits. Mr. A. C. Savidge, secretary and sales manager, was in charge.

THE STANLEY INSTRUMENT COMPANY, Great Barrington, Mass. Messrs. F. J. Alderson and F. C. R. Spence interested many central station men in its new rotated jewel-bearing meters for alternating-current circuits, which the company had on exhibition.

THE LOCKE INSULATOR MANUFACTURING COMPANY, Victor, N. Y., showed samples of its well-known high-tension insulators up to 120,000 volts.

THE NATIONAL BATTERY COMPANY, Buffalo, N. Y., exhibited three of its complete cells connected in series, also various parts of its storage batteries. General sales manager J. W. Gillette was in attendance.

HENDRIE & BOLTHOFF MFG. AND SUPPLY CO., of Denver, had three large parlors at the Brown Palace with a large staff of energetic representatives constantly in attendance looking after the constant stream of visitors. This company is the local representative of the National Electric Co.; H. W. Johns Manville Co.; Stanley Electric Instrument Co.; Stanley-G. I. arc lamps, Century motors; Roebling wires and cables; Electric Controller and Supply Co., specialties; Whitney instruments; Kuhlman transformers; Fleming and Harrisburg engines; Cahall boilers; Kewanee boilers, Morison boilers, Nordberg Corliss engines; Chase engines, and Stillwell steam specialties; as well as general electrical supplies.

THE H. W. JOHNS-MANVILLE COMPANY, of New York, had a very complete exhibit, embracing a full line of National Electric Code standard fuses up to 600 amp.; fuse plugs, 1 to 30 amp., and 31 to 60 amp.; double and single brass blocks, and two and three-pole main line blocks. It also displayed a full line of Noark standard fuses 250, 600, 2,500, 5,000 and 10,000 volts; blocks and fuses; front and rear connection contacts; two and three-pole, 250 and 600-volt service cut-out boxes, and main line single and double-branch subway boxes. Its exhibit also included a representative line of moulded overhead line material, moulded mica weather-proof sockets, high-tension strain insulators of a working pressure up to and including 5,000 volts. The exhibit was in charge of J. M. Perry, manager, and J. W. Hardy, the company's Milwaukee representative.

THE FORT WAYNE ELECTRIC WORKS, Fort Wayne, Ind., had an interesting working exhibit of its new Wood prepayment wattmeters designed for dimes and quarters, and constructed so as to be adapted to any type of meter on the market. It is claimed that this meter can be operated only by the coins for which it is designed, all others passing through without operating it. The switching mechanism is designed on the lines of a modern circuit-breaker, making four breaks in the circuit and adapted for two or three-wire service. The exhibit also included multiphase and switchboard meters and was in charge of Messrs. J. J. Wood, F. S. Hunting and A. A. Serva.

THE HIGH-TENSION ELECTRICAL SPECIALTY COMPANY, of Newton, Mass., showed one of its high-tension, weather-proof, oil-break switches, which are adapted for 3,000, 4,600 and 6,900-volt systems.

WAGNER ELECTRIC MANUFACTURING COMPANY, of St. Louis, had a parlor on the same floor with and near the convention hall and Messrs. V. W. Bergenthal, Geo. B. Foster and G. P. Cole took many of the delegates to the store of Gilbert, Wilkes & Co., its local representatives, where the company carries a large stock of single-phase motors, transformers and instruments. In its convention headquarters the company distributed a large number of its bulletins.

WESTERN ELECTRIC COMPANY, of New York and Chicago, had a very interesting exhibit of its arc lamps, D. & W. fuses, Thomas high-tension insulators and Brookfield glass insulators. The company's interests were well taken care of by E. W. Rockafellow, manager New York sales department; W. F. Hessel, manager Chicago sales department; A. L. Tucker, manager apparatus department,

Chicago, and F. B. Killion, Chicago, who has charge of the company's fuse business.

THE COLUMBIA INCANDESCENT LAMP CO., St. Louis, was represented by Mr. J. S. Lehmann, who distributed attractive leather match boxes as souvenirs.

DUNCAN ELECTRIC MANUFACTURING COMPANY, Lafayette, Ind., showed samples of its well-known line of direct-current wattmeters of different sizes and voltages. W. H. Sinks was in charge.

PHILADELPHIA ELECTRICAL MANUFACTURING COMPANY, Philadelphia. Manager C. L. Bundy displayed samples of its extensive line of copper hoods and deflectors, incandescent street lighting fixtures, screw glass insulators, arc lamp cut-outs, fuse boxes, service terminals and patented metal wrappers for conduit joints.

BABCOCK & WILCOX COMPANY, New York, showed a model of its boiler in the rooms of the Onderdonk Engineering Company, its Denver representative.

LAGONDA MANUFACTURING COMPANY, Springfield, Ohio. T. P. Molloy interested many callers in his company's line of turbine boiler cleaners, tube cutters and tube cleaners, reseating machines and damper regulators, samples of which were on exhibition, and in which the company is doing a large and constantly growing business among electric lighting plants. A useful celluloid pocket rule was given as a souvenir.

SIMPLEX ELECTRIC HEATING COMPANY, Cambridgeport, Mass., had a large parlor filled with an interesting exhibit of heating and cooking appliances, including new treeing irons for shoe shop work and new "Indispensable" water heaters. Manager James I. Ayer and C. W. Richards were in attendance.

REYNOLDS ELECTRIC FLASHER MANUFACTURING COMPANY, Chicago, displayed the improved Reynolds and Reco electric sign flashers. President C. F. Zeigler was unable to be present, but was ably represented by Mr. I. A. Bennett, who had a parlor on the eighth floor.

OSBURN FLEXIBLE CONDUIT COMPANY, New York, showed samples of its well-known Flexduct conduit and distributed tasteful souvenir scarf pins. The company's interests were looked after by Mr. I. A. Bennett, of Chicago.

NATIONAL ELECTRIC COMPANY, Milwaukee. One of the handsomest and most acceptable souvenirs of the convention was distributed by Mr. C. G. Burton, who presided in the company's parlor. It was a watch fob consisting of a heavily gold-plated miniature field ring of the National alternating and direct-current machines, suspended from a heavy silk ribbon.

FEDERAL ELECTRIC COMPANY, Chicago, had an attractive parlor in charge of J. M. Gilchrist, who made a comprehensive exhibit of electric signs, meridian clusters for both indoor and outdoor use, clamp sockets and bushings manufactured by his company.

MOLONEY ELECTRIC COMPANY, St. Louis. While the well-known transformers of this company were not exhibited, their merits were made known to many central station men by President T. O. Moloney, whose indefatigable labors have secured a widespread popularity for his company's product.

BUCKEYE ELECTRIC COMPANY, Cleveland. While the company had no exhibit at the convention, Manager L. L. Sawyer, of the Cleveland office, made many new friends for his lamps and many a delegate left with the idea that when his next lamp order was placed he had "Better Buy Buckeye."

BRYAN-MARSH COMPANY, Chicago and New York, did not make an exhibit, but it hardly seemed necessary in view of the presence of its energetic Chicago manager, E. H. Haughton, who interested many central station men in the merits of the well-known Imperial incandescent lamps manufactured by his company.

NATIONAL ELECTRIC LAMP COMPANY, of Cleveland, was represented by J. Robert Crouse, Jr., chairman of the advertising committee, who circulated a very interesting paper on central station advertising methods and the necessity of greater activity in pushing business by central station managers.

WESTERN DISPLAY COMPANY, of St. Paul, Minn., exhibited a handsome reflective sign equipped with eight 10-cp lamps in the main corridor adjoining the convention hall.

SANGAMO ELECTRIC MANUFACTURING COMPANY, Springfield, Ill., R. C. Lanphier, superintendent, interested many central station men in its working exhibit of new types of meters for direct current recently perfected. Among these was an 800-amp. meter just completed for the Colorado Fuel & Iron Company. A convenient pocket looking glass was given as a souvenir.

NATIONAL CARBON COMPANY, Cleveland, was represented by Messrs. J. S. Crider, secretary; N. C. Cotabish, sales manager; J. F. Kerlin, assistant sales manager, and C. W. Wilkins. A very attractive souvenir was distributed in the shape of a pocket size electric battery lamp.

ELECTRIC APPLIANCE COMPANY, of Chicago, whose rapidly increasing business has compelled the erection and recent occupancy of a new and larger building, as recently noted in these pages, was represented by President W. W. Low.

DEARBORN DRUG & CHEMICAL WORKS, Chicago, distributed bottles of perfume extract and Messrs. F. A. Earls, R. W. Francis and George R. Carr made many new friends for the boiler compounds which their company has had in successful use for many years in lighting and power plants.

MOBILE ELECTRIC COMPANY, Newark, N. J., which has recently entered the field as manufacturers of electric signs, was represented by President Percy E. Ingalls and Secretary E. E. Whitehorne. One of its signs—a large one—was in nightly operation on the building of the Denver Gas & Electric Company opposite the hotel.

CENTRAL ELECTRIC COMPANY, Chicago, was represented by President George A. McKinlock, who distributed handsome silver watch fobs with the association insignia, $C = \frac{E}{R}$, on one side and the name of his company and Okonite on the other.

CROCKER-WHEELER ELECTRIC COMPANY, Ampere, N. J., sent out handsomely engraved invitations to the delegates to visit its Denver offices. Its interests at the convention were well taken care of by Messrs. William F. Sullivan, Ampere, N. J.; Julian Roe, Chicago, and R. E. Miller, Denver.

AMERICAN ELECTRICAL SUPPLY COMPANY, Chicago, was represented by President C. E. Browne, who distributed a very useful souvenir in the form of a celluloid handbag label on which the name and address of the owner could be written.

ALSO PRESENT.—Other companies not exhibiting but represented were as follows: Atlantic Insulated Wire & Cable Company, New York, George F. Porter, sales manager. ELECTRICAL WORLD AND ENGINEER, J. M. Wakeman, president; T. C. Martin, editor, New York; J. R. Cravath, editor, Chicago; J. V. S. Church, Western manager, Chicago. Ko Sign Company, Denver, Charles F. Heywood, manager. American Steel & Wire Company, Chicago, H. J. Woelke, E. R. Poole, W. E. Benedict, Denver. Benjamin Electric Manufacturing Company, Chicago, R. B. Benjamin, manager. John A. Roebling's Sons Co., E. B. Bartlett, Chicago. Pawling & Harnischfeger, Milwaukee, W. E. Kreamer. Electric Storage Battery Company, G. H. Atkin, Chicago manager, and T. B. Entz, St. Louis. De La Vergne Machine Company, New York, C. E. Lucke. Arnold Company, Chicago, W. L. Arnold. American Circular Loom Company, Chelsea, Mass., Thomas G. Grier, Western manager, Chicago. *Electrical Review*, Stephen H. Goddard, manager, New York; L. W. Marshall, Chicago. New York & Ohio Company, Warren, Ohio, W. D. Packard, manager. Western Chemical Manufacturing Company, Denver, L. B. Skinner. Electrical Testing Laboratories, New York, W. S. Howell, manager. Phoenix Glass Company, New York, A. H. Patterson, vice-president and manager; E. H. Fox, Chicago. Okonite Company, New York, George T. Manson, superintendent. Baker & Co., Inc., New York City, C. O. Baker, president. Chase-Shawmut Company, Newburyport, Mass., George A. Gray. India Rubber & Gutta Percha Insulating Company, New York, J. B. Olson, manager sales department. Western Lumber & Pole Company, Denver, B. F. Vreeland, president. American District Steam Company, Lockport, N. Y., C. R. Bishop, secretary and manager; H. C. Eddy, Western manager, Chicago. Chicago Fuse Wire & Manufacturing Company, Chicago, W. W. Merrill, manager. Otis Elevator Company, J. F. Elam, Denver. *American Electrician*, A. E. Clifford, vice-president and business manager, New York; C. P. Lampman, Western manager, Chicago. Bryan-Marsh Company, S. E. Doane, Cleveland; L. E. Mason, Denver. Standard Underground Cable Company, Pittsburg; J. R. Wiley, manager Chicago office; E. J. Pietzcker, Southwestern manager, St. Louis. Pass & Seymour, Solvay, N. Y., John W. Brooks, manager; J. S. Jackson, Chicago. Stanley-G. I. Electric Manufacturing Company, Pittsfield, Mass., Martin J. Insull, third vice-president; Thomas F. Clohesey, sales manager, St. Louis. Capital Electric Company, Denver, A. R Hall, president. Jeffrey Manufacturing Company, Columbus, Ohio, F. R. Field, Western sales manager. Flint Lomax Electric Manufacturing Company, Denver, F. W. Lomax, manager.

# Industrial and Commercial News

## Commercial Intelligence.

THE WEEK IN TRADE.—The weather conditions are much improved and a better feeling prevails, although trade reports are still irregular and in many cities below expectations. Crop reports and conditions are more satisfactory; there was a larger volume of retail trade and improved re-order business at wholesale. Relatively best advices come from surplus cereal-crop producing regions, but the feeling at the South is likewise better. Against this is to be noted some temporary quieting, due to rains or cold weather in the Northwest, the Lake region and the East, while new business in iron and steel is smaller and prices are easing. All measures of trade movement still point unmistakably to large gains in all lines over a year ago. Crop reports took a turn for the better in winter wheat, corn and cotton crop prospects. Heavy rains have not hurt spring wheat in Minnesota and the Dakotas. Corn has made some progress, though still backward. Higher temperatures now present give hope of lost ground being regained. Manufacturing activity is fully maintained in textile fabrics, and there is an enormous output of iron and steel, despite some reduction from last month's record-breaking rate of production. Building operations are large and materials in excellent demand. Quiet current conditions and confidence in a revival of interest after July 1 sum up the pig iron situation. Many steel mills are unable to make deliveries for several months, owing to the amount of business already on the books, and in the various departments supplying railway equipment there is little anxiety regarding the future. Structural steel is also a satisfactory division, new contracts constantly coming forward, and wire products move more freely; but, as a rule, the lighter lines are comparatively quiet, although not unseasonably so. Textile manufacturers are in a strong position, buyers gradually appreciating the changed situation. There is little speculative buying, but more disposition to provide for future requirements. Prices are very firm on account of the statistical position, and there is less effort to force concessions as the agents assume a more independent attitude. Copper moved more freely but prices are unchanged. Lake and electrolytic are held at 15c., for early delivery, and casting stock at 14¾c.

AUTOMOBILES IN UNITED STATES COMMERCE.—The Department of Commerce and Labor has prepared a compilation of imports and exports of automobiles in the commerce of the United States, showing that practically a million dollars' worth of automobiles and parts have been exported since the beginning of the present calendar year. The first record of the importation of foreign-built automobiles into the United States was for the fiscal year 1901, when 26 automobiles, valued at $43,126, were imported into the country. Since that year, however, the imports have steadily increased, having grown from 26 in 1901 to 423 in 1904, while their value (including automobile parts) has increased from $47,471 in 1901 to $1,446,303 in the last fiscal year. The relative rank of the various countries in the importation of automobiles into the United States during the last fiscal year will be seen from the following table:

Importations of Automobiles into the United States, by Countries, During Year Ending June 30, 1904.

| Countires from which imported. | Number. | Value. |
|---|---|---|
| France | 368 | $1,117,494 |
| Germany | 22 | 69,099 |
| England | 15 | 54,013 |
| Italy | 13 | 34,620 |
| Ireland | 1 | 9,733 |
| Switzerland | 3 | 7,501 |
| Cuba | 1 | 1,700 |
| Total | 423 | $1,294,160 |

Note.—In adition, parts of automobiles were imported as follows: From France, $149,535 Italy, $2,462, and from England, $146.

The rate of duty assessed on importations of automobiles and parts of is 45 per cent ad valorem, and the aggregate amount of duties paid on the total imports thereof since 1901 is $1,373,835, having been $21,359 in 1901, ,$247,590 in 1902, $454,050 in 1903, and $650,836 in 1904. The exportations of automobiles of domestic manufacture have been recorded only since 1902. In that year the total exportation of automobiles and parts thereof was $948,528; in 1903 the total had increased to $1,207,064, and by 1904 the total was $1,895,605; while for the ten months of the fiscal year 1905, for which figures are available, the total is $1,876,063, thus indicating a record of over $2,200,000 for the complete year which ends with the present month. The United Kingdom and Canada take about three-fourths of the automobiles and parts thereof that are exported from the United States. During the fiscal year 1904 automobiles and parts thereof of domestic manufacture were exported to the value of $1,895,605, of which $1,020,681 went to Europe, mainly to the United Kingdom, $498,799 to North America, principally to the Dominion of Canada, and $376,125 to other countries.

POWER DEVELOPMENT IN TENNESSEE.—The big project in the erection of the 36,000-hp lock and dam power plant at Hale's Bar in the Tennessee River is considered an assured fact. C. E. James and J. C. Guild, the promoters of the scheme, have been in New York, where they completed the details concerning the financing of the scheme. It is announced in this connection that as soon as the plant is erected several new manufacturing plants will be erected at Chattanooga, one of them having a capital stock of over $1,000,000. The promoters will apply for a charter in a few days with $3,000,000 capital stock. The following will be the incorporators: C. E. James, J. C. Guild, J. C. Sims, R. H. Williams and George D. Lancaster. The plant will be located 12 miles from Chattanooga. The dam will be built of cement and stone, being 57 feet at the base, 9 feet at the top and 35 feet in height. The gates will cost $150,000 and will be furnished by the Government. The power plant will be located on the east side of the river and will be 60x30 feet in dimensions and 57 feet in height. Thirty-six turbine wheels will furnish the power to twelve generators.

STROMBERG-CARLSON INCREASE.—The Stromberg-Carlson Telephone Manufacturing Company has become the owner of a seven-acre tract of land immediately west of its plant at University Avenue and Culver Road, Rochester, which will be used for an extensive addition to its buildings, to be constructed probably within the present year. The increasing business of the corporation made necessary the enlargement of the plant, and the purchase was made on account of the fact that the property fronts on the New York Central Railroad, thus affording highly desirable shipping facilities. With the new buildings and facilities for both manufacture and shipping, the Stromberg-Carlson plant, it is believed, will rank among the most important industries of Rochester.

FRENCH WESTINGHOUSE.—It is stated that the French Westinghouse Company has closed an important contract for a railway installation in Italy, involving the use of quadruple, 75-hp, single-phase motor equipments with the Westinghouse electro-pneumatic control. The contract also calls for the erection of a power house and the complete line construction. The power house apparatus will be made by the French company at its Havre works, but the single-phase motors and electro-pneumatic control will be the same as that which has already been installed upon several lines in the United States by the Westinghouse Electric & Manufacturing Company and will be supplied by that company from its Pittsburg works.

LARGE CONTRACTS FOR JAPAN.—Contracts amounting to fully $5,000,000, calling for the shipment, with all despatch, of electrical equipment, machines and tools, have been placed in this market on Japanese account. The orders were mostly closed by the New York representatives of Japanese firms. The machinery is for installation in the principal government shipbuilding yards and arsenals. Because of the inauguration of a war tax from 1 to 10 per cent on various foreign equipments entering Japan July 1, most of the orders call for shipment overland to the Pacific coast.

ELECTRICAL POWER PLANT FOR OZARK.—The city of Ozark is contemplating the construction of a 300-hp dam across Choctawhatchee River, seven miles from the city, and intends to install an electrical power plant. Plans and specifications are now being prepared by the city engineer and the erection of this dam and plant will be in his charge. Machinery and material only will be needed. Address Marvin McDonald, superintendent and city engineer.

ORDERS FROM JAPAN.—It is stated that the Japanese Government has placed contracts in this country for something like $5,000,000 of electrical equipment machines and tools for installation in government shipbuilding yards and arsenals. The equipment is required immediately as it can now be delivered without any fear of hold-up by Russian fleets.

BIDS FOR ELECTRIC LIGHTING.—Bids will be received until June 19 by Major John E. Baxter, Quartermaster, U. S. A., Boston, for furnishing materials and installing a system for interior and exterior electric lighting, with fixtures and lamps, ready for use, at Fort Warren, Mass.

POWER MOTORS WANTED.—The Great Bend Electric Company, of Great Bend, Kan., C. E. Stromquist, manager, is preparing to give day service, and is in the market for small 60-cycle power motors.

COMPETITION WITH STEAM ROADS.—It is remarked by the Chicago *Interocean* that the competition for both freight and passenger traffic between steam and electric railroads has already reached a point which officials of steam railways only a few years ago declared would never come. "A good local illustration is the effort of the Metropolitan Elevated road to secure a city ordinance enabling it to carry freight and express as well as passengers. The Aurora, Elgin & Chicago Electric line is really back of the Metropolitan's new move. The Aurora line has secured an enormous milk traffic between the Fox River Valley and the city limits, taking it from the Burlington and Northwestern roads, and wants to land part of the milk at its Fifth Avenue depot. The steam roads are said to be using their influence to prevent the city council from granting the ordinance desired by the Metropolitan line." The Chicago & South Shore Interurban Railway, connecting La Porte and Michigan City, Ind., was sold on May 26 at receiver's sale for $450,000 to the bondholders. The latter will sell it to the Indiana Railway Company, owning lines running out of South Bend, Ind., which proposes to build a line from South Bend to La Porte, and ultimately extend it to Chicago, to form part of a continuous electric line between Cleveland and Chicago. The "mysterious" purchase of options on land along the Huron River and the lake region north of Dexter, Mich., has given rise to the report that the purchases are in the interest of the Michigan Central Railroad, which, it is asserted, will build a great dam across the Huron River at a point between Dexter and the chain of lakes, and will erect a huge power house to furnish power for operating by electricity the trains of the Michigan Central, both east and west of Ypsilanti.

DETROIT MUNICIPAL PLANT.—The apparatus required for the new municipal plant at Detroit is as follows: One 2,800-hp. three-crank triple expansion condensing engine or one 2,000-kw. steam turbine; one jet condenser with duplex, direct-acting pump, having a capacity to condense 50,000 pounds of exhaust steam per hour, or one barometric condenser and combined water and vacuum pump of the same capacity, or any other first-class condensing device meeting the requirements specified for the other two types of pumps; one boiler feed pump of 50,000 gallons per hour capacity; one 2,000-kw. alternating current two-phase 60-cycle 2,300-volt generator, with a field rheostat capable of adjusting the voltage from 2,000 to 2,400 volts with a normal speed and 25 per cent. overload. Separate bids will be taken on instruments and switches. The following instruments are required: For 60-cycle 2,300-volt alternating current, two ammeters, two singlephase indicating wattmeters; one two-phase power-factor meter and one frequency meter; for direct current, one ammeter of the shunt type, two four-pole single throw oil switches of 600 amp. per pole capacity and one quick-break double-pole switch, with a capacity of 300 amp. per blade at 125 volts. Bids close June 22. They will be received by the Public Lighting Commission, of which John Erhard is president and F. T. Bowler, secretary.

FOREIGN TELEPHONE TRADE.—The foreign demand for the "growing" exchange system and telephone apparatus manufactured by the International Telephone Manufacturing Company, Chicago, is, like the system, "growing." Among the recent orders secured and shipments made by this company are, a complete public exchange equipment for Santo Rosalia, Chihuahua, Mexico, consisting of a self-restoring drop switchboard and central office apparatus and telephone; the necessary apparatus for an additional section for Fort William, Ontario, increasing the 1,000 line-capacity, central-energy, lamp-signal, multiple-capacity switchboard, together with telephones; a complete central energy equipment for railway service to Apostolos Agathocles, at Athens, Greece; a shipment of telephones for increasing the public service system of the municipality of Neepawa, Manitoba; a complete central office equipment for the St. Catherines & St. Bastile Telephone Company, of St. Catherines, Quebec, consisting of self-restoring drop switchboard; additional apparatus for a 2,400-line capacity, self-restoring drop multiple central energy switchboard for the Comp. Telephonica do Estado de S. Paulo, of Sao Paulo, Brazil, and a large order of central energy telephones for the public service system of the town of Port Arthur, Ontario.

RAILWAYS FOR THE PHILIPPINES.—The plans and specifications of the system of railways which the Philippines Government proposes to have constructed in the archipelago have been made public in a prospectus just issued by Secretary of War Taft through the Bureau of Insular Affairs. The scheme involves the construction of approximately 1,233 miles of railway in the various islands of the Philippines group. The motive power may be either steam or electricity, as the Philippines Government, which will have entire control of the handling of bids and the granting of concessions, may decide. The roads are to be exempt from all taxation and in lieu thereof the Philippines Government shall be paid an amount equal to one-half of 1 per cent. of the gross earnings for thirty years, 1½ per cent. for fifty years thereafter, and subsequently the amount shall be fixed by the Philippines Government.

STEEL CARS.—The Erie Railroad has given orders for the construction of several steel postal cars and one is completed. Should the new steel car prove a success the Erie will try the experiment with a steel passenger coach. Railroad men believe that regular steel cars for general passenger traffic are bound to come within a comparatively short time. Steel cars are already in use in the New York subway, and although somewhat smaller and lighter than the usual railroad coach, their successful operation nevertheless, according to railroad men, augurs well for similar success in the use of steel railway cars. The principal objection to the steel car is the increase in the noise made in operation. This has been counteracted in the Erie's postal cars by the use of wood decking under the steel floor, insulated on top with hair felt. This hair felt has also been used as insulation against heat and cold. All wood used is fireproofed.

IDAHO IMPROVEMENTS.—Mr. E. H. Libby has recently completed his work on the Lewiston-Clarkson improvements. The plant has had added to it a 1,000-hp. Westinghouse turbo-generator outfit designed primarily for the purpose of an auxiliary station to act in conjunction with the present and proposed hydraulic power stations of the company. The circuits are also interesting. The span over the Snake River at Clarkson is one of the largest in the Northwest, being nearly 2,500 feet between towers. The substations at Moscow and Genesee are designed to carry the respective loads at those two towns and as present installed will carry 400 hp. at Moscow and 200 hp. at Genesee, supplying residence and municipal lighting and municipal pumping, flour mills, refrigerating plants, machine shops and numerous other purposes.

A DRILL MERGER.—It is announced that a consolidation of the Ingersoll-Sergeant Company and the Rand Drill Company has been made through the incorporation of the Ingersoll-Rand Company under the laws of New Jersey. The new company will have a capital stock of $10,000,000 and will manufacture air compressors, mining and quarrying machinery and pneumatic tubes as well as drills. W. L. Saunders, formerly president of the Ingersoll Company, has been elected president of the new company. The Ingersoll shops are located at Phillipsburg, N. J., and Easton, Pa. The Rand shops are located at Tarrytown, N. Y., Ossining, N. Y., Painted Post, N. Y., New York City and Sherbrooke, Que.

NAVY BIDS.—Bids will be received until June 27 at the Bureau of Supplies and Accounts, Navy Department, Washington, for furnishing at the navy yards at Portsmouth, N. H.; Newport, R. I.; New York, N. Y.; League Island, Pa.; Washington, D. C.; Annapolis, Md., and Indian Head, Md., naval supplies as follows: Generators, electrical supplies, rheostats, motors, incandescent lamps, forges, drill press, pipe cutting machines, steam engines, steam gauges, etc. Address H. T. B. Harris, Paymaster-General, U. S. N.

GRAPHITE COMPANY IN CANADA.—The International Acheson Graphite Company is about to break ground on the Canadian side at Niagara Falls for a new factory, in order that its Canadian patents may be protected and also that it may meet the Canadian demand for its goods. W. H. Arison will be manager of the Canadian branch. It is also reported that a company that will use the company's product is likely to locate a factory on the Canadian side.

BIDS FOR ARMY PLANTS.—Bids will be received by Capt. A. W. Yates, quartermaster U. S. A., Portland, Me., June 20, for an electric light and power distributing system at Fort McKinley, Me. Bids are to be received June 15 by the constructing quartermaster, U. S. A., New London, Conn., for installing an electric lighting system at Fort Mansfield.

G. M. GEST, the expert subway contractor of New York and Cincinnati, has just been awarded the contract for the construction of a complete underground conduit system for the Montreal Light, Heat & Power Company, at Montreal, Canada. Over a million feet of conduit is to be used in the construction.

STANLEY-G. I. CONTRACTS.—It is stated that the Montgomery, Ala., Water Power & Electric Company has placed with the Stanley-G. I. Electric Company, of Pittsfield, Mass., a $25,000 contract for generators and switchboards, and that the Chicago Edison Company has placed an order for $30,000 for switchboards.

THE C & C ELECTRIC COMPANY reports having taken a number of orders recently for direct-connected motors for driving machine tools. Among others is one from its Pittsburg office for some 20 motors, nearly all of which are of the variable-speed type.

BIDS FOR SCHOOL EQUIPMENT.—Bids will be received until June 26 by C. B. J. Snyder, Superintendent of School Buildings, for installing electric equipments in School 38, Borough of Manhattan.

EXPORTS TO CANADA.—The exports of electrical machinery from the United States to Canada during the ten months ending April 30, 1905, were valued at $1,309,555.

# Financial Intelligence.

THE WEEK IN WALL STREET.—Irregularities characterized the stock market, dealings being narrow and entirely professional. There was a firmer tone, however, due to peace negotiations and more favorable crop news, though the continued complications in prominent insurance circles are considered highly deterrent to speculative confidence. The publication of Amalgamated Copper's first report created disappointment. Southern stocks were a strong feature, apparently on manipulation. All of the electric and traction securities were firmer and prices have advanced on moderate trading. Both issues of Allis-Chalmers are up, ⅜ of a point for the common and 1⅜ for the preferred, the closing quotations being 14 and 52½, respectively. General Electric is ¼-point better off, closing at 173½. Western Union advanced 1 point, and closed at 94, and American Telephone & Telegraph gained 2⅜, the closing price of the week being 140⅝. Brooklyn Rapid Transit closed at 64⅞, a gain of 1⅛, on sales of 66,000 shares. Metropolitan Street Railway closed at 123, which was also the highest quotation for the week, the net gain being 4⅜ points. Interborough Rapid Transit was active and strong, gaining 3 points net, the closing price being 203½. The curb market was dull and featureless, with irregular prices, but with a higher tendency at the close of the week. Chicago Subway was very strong and reactionary by turns. Following are the closing quotations of June 13:

NEW YORK

| | June 6 | June 13 | | June 6 | June 13 |
|---|---|---|---|---|---|
| Allis-Chalmers Co. | 14 | 14⅜ | Electric Vehicle pfd. | 20¼ | 20 |
| Allis-Chalmers Co. pfd. | 51 | 51 | General Electric | 172 | 174 |
| American Tel. & Cable. | 90 | 90 | Hudson River Tel. | .. | .. |
| American Tel. & Tel. | 139 | 139 | Interborough Rap. Tran. | 201 | 202¼ |
| American Dist. Tel. | 28 | 28 | Metropolitan St. Ry. | 118¾ | 122⅞ |
| Brooklyn Rapid Transit. | 62¾ | 64 | N. Y. & N. J. Tel. | .. | .. |
| Commercial Cable | .. | .. | Marconi Tel. | .. | .. |
| Electric Boat | 30 | 29 | Western Union Tel. | 92⅛ | 93⅛ |
| Electric Boat pfd. | 73 | 71 | Westinghouse com. | 164 | 166¾ |
| Electric Lead Reduction | .. | .. | Westinghouse pfd. | .. | .. |
| Electric Vehicle | 16 | 15⅛ | | | |

BOSTON

| | June 6 | June 13 | | June 6 | June 13 |
|---|---|---|---|---|---|
| American Tel. & Tel. | 139 | 139½ | Western Tel. & Tel. pfd. | *98 | 98 |
| Cumberland Telephone. | 119 | 119¼ | Mexican Telephone | 1¼ | 1¼ |
| Edison Elec. Illum. | *245 | *245 | New England Telephone. | 137¼ | 139 |
| General Electric | 173 | 175 | Mass. Elec. Ry. | 16 | 17 |
| Western Tel. & Tel. | *17¾ | 15 | Mass. Elec. Ry. pfd. | 58½ | 58 |

PHILADELPHIA

| | June 6 | June 13 | | June 6 | June 13 |
|---|---|---|---|---|---|
| American Railways | 50 | 50 | Phila. Traction | .. | .. |
| Elec. Storage Battery | 75 | 79 | Phila. Electric | 8¾ | 9⅛ |
| Elec. Storage Battery pfd. | .. | .. | Phila. Rapid Trans. | 27⅛ | 26¾ |
| Elec. Co. of America | 11¼ | 11¾ | | | |

CHICAGO

| | June 6 | June 13 | | June 6 | June 13 |
|---|---|---|---|---|---|
| Central Union Tel. | .. | . | National Carbon pfd. | 116 | 115 |
| Chicago Edison | .. | .. | Metropolitan Elev. com. | 23 | 23½ |
| Chicago City Ry | .. | .. | Union Traction | .. | .. |
| Chicago Tel. Co. | .. | .. | Union Traction pfd. | .. | .. |
| National Carbon | 60 | 62 | | | |

* Asked.

KEYSTONE TELEPHONE BONDS.—It is announced from Philadelphia that the Keystone Telephone interests say their financiering plan is not yet completed. It is figured that the exchange of securities will make about $5,500,000 new bonds outstanding on the basis of exchange proposed; $56 for each 50 par share of the $2,000,000 Keystone preferred will take up $2,240,000 of the new bonds and $8 for each 50 par share of the Keystone common will take up $800,000 more; to take up the $2,500,000 or so floating debt will require about $2,500,000 more, making a total of $5,500,000 on account of exchange of securities and extinguishment of floating debt. It is understood that at least this amount of new bonds will be issued at once, under the plan, and a total authorized issue of $10,000,000 is favored, a balance to be held in the treasury for future improvements. The interest on upwards of $5,500,000 bonds, or $275,000 per annum at 5 per cent., can be well taken care of, on the face of the company's showing, which gave $352,438 net earnings in 1904, and earning are steadily increasing. The gross receipts in 1904 were $685,740. As a part of this arrangement, it is understood that the old $2,500,000 bonds of the Keystone Telephone Company of Pennsylvania, which were never sold by the company, but were held as collateral by the bankers for the loan to the company, will be retired and cancelled, and the new bonds made the obligation of the present operating company, the Keystone Telephone Company of New Jersey.

FEDERAL TELEPHONE COMPANY.—A despatch from Cleveland, printed in the *Wall Street Journal*, says the Federal Telephone Company will soon be dissolved. The company owes about $3,000,000. To liquidate it would be necessary to make an assessment of $30 a share on the stock, which has a par value of $10 a share. This plan will not be followed exactly, but the scheme of liquidation means about the same thing. The assets of the company, comprising the controlling interests in ten companies, including the independent exchange in Cleveland, the Cuyahoga Telephone Company, the Long Distance Independent Company and the United States Telephone Company, will be sold to the stockholders, and the money will be used to pay the debts. The Federal Telephone Company has a capitalization of $1,000,000 and no funded debt. Its embarrassment five years ago led to the failure of the Everett-Moore syndicaate and the complication of the Cleveland financial situation. The Federal Telephone Company originally held the securities of twenty-two companies. Twelve of these companies have been sold, leaving the company in control of the stocks of but ten companies.

HUDSON RIVER TELEPHONE.—According to the *Wall Street Journal* unusual activity was displayed in Hudson River Telephone stock during the past week. The price was marked up about a point. During the current year to June 1 the company shows a net gain in stations of nearly 4,000, and the figures at present indicate that the net gain in Albany will be fully a thousand stations before the end of the year, while for the company's entire territory the increase will be more than 8,000. The company's directors will meet to act on the regular quarterly dividend on June 29 and the dividend is payable on July 15. New buildings are being pushed to completion by the company for the purposes at Saratoga, Newburg, Rensselaer, Plattsburg, Sandy Hill and Peekskill.

DIVIDENDS.—The directors of the Union Traction Company, of Philadelphia, have declared a semi-annual dividend of $1 per share, payable July 1. The directors of the Strowger Automatic Telephone Exchange, Chicago, have declared the regular semi-annual dividend of 50 cents per share, payable July 1. The directors of the Interborough Rapid Transit Company have declared a dividend of 2 per cent, placing the stock on an 8 per cent basis. The last one was 1¾ per cent. The dividend will be payable July 3. The directors of the Boston Suburban Electric Company have declared a regular quarterly dividend of 50 cents per share, payable July 15. The Western Union executive committee has recommended the declaration of the regular quarterly dividend of 1¼ per cent.

MONTREAL LIGHT, HEAT & POWER COMPANY.—The fourth annual report of the Montreal Light, Heat & Power Company shows a surplus of $448,789, as compared with $204,013 last year. The principal features of the report may be stated as follows: The gross revenue for the year amounted to $2,901,264, and the net profits, after providing for fixed charges, interest, etc., to $1,128,789, being an increase over the previous year of $311,818 gross, and $244,775 net. The increase in both the gross and net earnings is considered satisfactory. There have been declared out of the net profits four quarterly dividends of one per cent each, amounting to $690,000, leaving a balance of $448,789, which, added to the surplus of $385,100, brought forward from last year, brings the surplus to $833,889.

PACIFIC STATES TELEPHONE.—The report of the Pacific States Telephone & Telegraph Company for the year ended December 31, 1904, shows total revenue, $6,824,506; operating expenses, maintenance, etc., $5,135,485; net revenue, $1,689,021. The general balance sheet as of December 31, 1904, follows: Assets, plant, etc., $21,224,943; real estate, $1,334,715; stocks and bonds, $438,658; supplies, $561,953; bond sinking fund, $300,000; cash, $213,317. Total, $24,073,586. Liabilities, capital stock, $13,964,800; bonded debt, $3,000,000; balance bills to accounts payable and receivable, $1,254,500; surplus and reserves, $5,854,286. Total, $24,073,586.

KANSAS CITY SECURITIES.—It is understood that arrangements are being made and that the management of the Kansas City Railway & Light Company will make application for listing the securities of the company on the New York Stock Exchange soon after the annual meeting of the company to be held in Jersey City, June 26. The company has an authorized capital stock of $25,000,000, equally divided in preferred and conmon stock. Of the total, $9,522,000 preferred and $9,635,000 of common shares are outstanding. In all, the company has thirteen classes of bonds, aggregating $22,855,000.

PORTLAND GENERAL ELECTRIC BONDS.—The mortgage bonds of the Portland (Oregon) General Electric Company to the amount of $4,000,000 secured by a first and only mortgage on all property of the company, operating under perpetual franchises, are being offered by N. W. Harris & Co., of New York City. The company controls the electric light and power business of the city of Portland and surrounding territory.

MERGING NEW YORK STREET RAILWAY INTERESTS.—The Brooklyn *Eagle* is authority for the statement that a gigantic merger of all the street railway companies in Greater New York is expected to be one of the results of the change in control of the Equitable Society.

NEW YORK & LONG ISLAND TRACTION COMPANY.—It is stated that Messrs. Sanderson & Porter have bought the New York & Long Island Traction Company. The price is said to be $1,500,000.

NEW ENGLAND TELEPHONE.—A Boston despatch states that the New England Telephone & Telegraph Company will require about $4,750,000 for new construction during the year.

# General News of the Week

## The Telephone.

MARSHALL, ARK.—The Marshall town council has granted a franchise to M. B. Storment for a telephone system.

LOS ANGELES, CAL.—The United States Long Distance Telegraph and Telephone Company, has installed a telephone system at Corona.

SAN JOSE, CAL.—San José is preparing to abolish telegraph, telephone and electric light wires from the streets in the business center and compel the companies to place the wires under ground.

SAN BERNARDINO, CAL.—Telephone lines are about to be built from Needles to San Bernardino, also down the west side of the Colorado River to the Santa Fé bridge and thence to Parker. Another line will extend from Ibex, a station on the Santa Fé, to Searchlight, Nev., and still another will reach from Barstow to Johannesburg and Kramer.

NEW HAVEN, CONN.—The officials of the Southern New England Telephone Company are still at work on plans for the underground trunk line wires which are to cross this state. It has now been decided to complete the work this year at least to this city. From this city the next stretch to be taken up will be to Springfield, and then to Worcester and to Boston. Within a few weeks the contract will be let.

TWIN FALLS, IDAHO.—The franchise and holdings of the Twin Falls Telephone Company have been acquired through purchase by the Rocky Mountain Bell Telephone Company.

LAWNDALE, ILL.—The Lawn Ridge Telephone Company has increased its capital stock from $3,500 to $21,000.

ROBINSON, ILL.—The Citizens' Mutual Telephone Company has been formed; capital, $2,400. The incorporators are M. D. Mills, A. N. Link and others.

ODELL, ILL.—The Odell Telephone Company has been incorporated with a capital of $2,500. The incorporators are George Desveigen and I. E. Desveigen.

COWDEN, ILL.—The Cowden Mutual Telephone Company has been incorporated with a capital of $2,500. The incorporators are S. Hodson and F. B. Bunn.

ROCKFORD, ILL.—The Rockford-Shirland telephone line, built by the Winnebago County Telephone Company, has been completed and connection made between the two towns.

PANOLA, ILL.—The Panola Farmers' Telephone Company has been incorporated with a capital stock of $1,300. The incorporators are Frank M. Taylor, V. M. Risser and J. H. Roth.

ROCKFORD, ILL.—The Rockford & Interurban Long-Distance Telephone Company has been incorporated, with a capital stock of $30,000. The incorporators are John H. Camlin, Edward W. Brown and T. M. Ellis.

CHICAGO ILL.—The regular monthly instrument statement of the Chicago Telephone Company for May shows a total increase in the number of telephones installed of 2,560, of which 1,882 were installed in the city and 678 in the country. The company now has in service 127,914 instruments.

SHELBYVILLE, IND.—The Mutual Telephone Company is asking for bids for the construction of an underground telephone system.

MARION, IND.—The Independent Telephone Company has purchased the Wilson & McCulloch private line between Marion and Converse.

PLAINVILLE, IND.—The Plainville Telephone Company will receive bids for the construction of a telephone plant. J. H. Russell is secretary.

WABASH, IND.—The Home Telephone Company is considering plans for a new and modern exchange building. Bids will be asked soon for the construction of the new building and later for its complete equipment.

MILTON, IND.—W. A. Medsker announces that he has procured the charter under which the Milton Telephone Company will operate and that the plant will be installed at once. The company recently incorporated with $10,000 capital stock.

PLAINVILLE, IND.—Th Plainville Telephone Company has filed articles of incorporation. The capital stock is $2,500. The company will build a plant and exchange in Plainville and extend the lines in Daviess County. N. E. Killion, Thos. Bennington and J. H. Russell are directors.

WINCHESTER, IND.—During a severe electric storm on May 30 the operators of the local telephone company were knocked from their seats and severely shocked. Four others were stunned and all were compelled to leave the room. Over 200 telephones were put out of commission.

INDIANAPOLIS, IND.—The American Telephone & Telegraph Company and the Jennings County Telephone Company are extending their lines. The purpose is to build a toll line from Chicago to Pittsburg. C. D. M. Cole, of New York, is looking after the company's business in this matter, and says the company is asking only the right to construct a line and one toll station in each county.

NORTH VERNON, IND.—The North Vernon & Vernon Telephone Company and the Jennings County Telephone Company are extending their lines to all parts of Jennings County and lapping over the borders of Scott, Jackson, Jefferson, Ripley and Decatur Counties. They have now 700 telephones in operation, and when the extensions are completed the number will be doubled, making a total of more than 1,400 in use in Jennings and contiguous counties.

SHELBYVILLE, IND.—The stockholders of the Mutual Telephone Company of this city held their monthly meeting last week, at which they instructed their board of directors to let the contracts for an entirely new plant, including an underground system. The 1,120 lines to be laid will have a capacity of 4,800 telephones. A new building will be erected which will include a power plant. The estimated cost of the improvements is $65,000 and the work will be completed within seven months.

INDIANAPOLIS, IND.—The Central Union Telephone Company has taken possession of its new warehouse and shop on Madison Avenue and Belt Railroad. A distributing plant for this city and the entire State has been established and a shop giving employment to sixty men has been opened. All the electrical appliances used in the State will be handled from the new warehouse and some of the appliances the company uses will be made here. The company has also started a new paper, the *Telephone Review*, a mouthpiece for the Central Union Company.

EVANSVILLE, IND.—The Southern Indiana Telephone Company has been formed by the consolidation of a dozen independent telephone companies operating in Vanderburg, Gibson and Warrick counties. The new company will incorporate with $10,000 capital. The consolidated company proposes to extend lines into Posey, Pike and other contiguous counties at once. Connection with independent companies across the Ohio River in Kentucky has been arranged. The officers are: P. H. Kleppel, of Elberfield, president; Thos. J. Umbech, of McCutchamville, vice-president; Daniel Crisp, of McCutchamville, secretary; H. Schuler, J. L. Whittinghill, James Henry and C. E. Moll, directors.

MARION, IND.—The independent telephone company has purchased the Wilson & McCulloch private line, between Marion and Converse, and will establish a long-distance toll line between Marion and Indianapolis by way of Converse. Other lines will be constructed, it is said, between Marion and surrounding cities, where the Bell Telephone Company has not purchased the controlling stock in the independent exchange. Representatives of the independent company have opened an office in Marion and will present a franchise to the City Council at its next meeting, June 6. It is said a local commercial exchange will also be installed within six months. The sale of the local united telephone exchange to the Bell Telephone Company has made it impossible for Marion citizens to reach parties in adjoining cities who have the independent company telephones, as the Bell Company will not give connections.

INDIANAPOLIS, IND.—The Central Union Telepone Company is making an aggressive fight to regain control of the telephone business in Indiana, lost several years ago by the Bell people, when strong independent companies were organized throughout the State and were successful in securing a major share of the telephone business. Since that time the plants operated by the Bell interests have been reorganized as the Central Union, which has been spending large sums of money on these plants and has greatly increased the efficiency of the service. The work has been done quietly and persistently, until the company is now strongly intrenched in nearly every section of the State, and is again a formidable competitor for the numerous independent companies. In addition to gaining control of the United Telephone Company and its territory, the company last week closed contracts which will give it exclusive long-distance service through the Jewett plant at St. Paul, and also independent systems at Batesville, Milan, Dillsborough, Moores Hill, Osgood and Versailles. The contracts with these plants open up a wide stretch of territory and indicate that the Central Union is proposing to take advantage of every opportunity for the extension of its business.

MOOREHEAD, IA.—A franchise has been voted the new Monona Telephone Company.

GOWRIE, IA.—The Lena Gowrie Telephone Company has been incorporated with a capital of $15,000.

DES MOINES, IOWA.—The Mutual Telephone Company will issue $100,000 bonds for improvements to its system.

CUMBERLAND, IOWA.—The Cumberland Mutual Switchboard Company has perfected an organization, electing the following officers: President, P. Pettinger; secretary, H. D. Fitch; treasurer, John Worthington.

SIOUX CITY, IOWA.—Work has been begun on the construction of the first of the New State Telephone Company's copper toll lines into Sioux City, this being the line connecting Sioux City with LeMars. At LeMars the line will open up a field of several hundred towns in northwestern Iowa and several thousand telephones, to be given connection with Sioux City under the new independent system.

MASON CITY, IOWA.—The Western Electric Telephone Company, whose main office is located at Mason City, has filed a chattel mortgage in Clay County on its property to secure bonds issued at the rate of 5 per cent. per annum for the sum of $600,000, due January 1, 1905. The property included in this mortgage covers the exchanges at Osage, Mason City, Charles City, Sheldon and 1,784 miles of long-distance lines in northern Iowa and southern Minnesota.

OLATHE, KAN.—F. R. Ogg and M. T. Miller have purchased the Olathe Citizens' Telephone Company.

HUTCHINSON, KAN.—Telephone systems in Hood and Somerville counties, including exchanges at Granbury and Glen Rose, and 140 miles of toll lins have been purchased by the Southwestern Telegraph & Telephone Company. Company.

BALTIMORE, MD.—The Maryland Telephone & Telegraph Company announces the completion of the western extension of its long-distance service, with a substantial reduction in the telephone rates to a number of important points. The points now covered by this company include cities in Maryland, Pennsylvania, Virginia, West Virginia, New Jersey and Delaware.

LEONARDTOWN, MD.—The Southern Maryland Telephone Company has made connection with the Chesapeake & Potomac Company at Brandywine, and Leonardtown now has communication over the 'phone with Baltimore and Washington. The local company will now devote its energies to extending its lines through St. Marys County. The Morganza and Bushwood extensions will soon be in commission.

MARQUETTE, MICH.—The Sagola Telephone Company has decided to build a line to Iron Mountain.

BENZONIA, MICH.—The Benzie County Telephone Company has let the contract for a new cement building to be erected upon the site of the frame building destroyed by fire the morning of May 3.

WYANDOTTE, MICH.—The Michigan Telephone Company will expend between $7,000 and $8,000 in refitting the Wyandotte exchange with a new switchboard.

ALPENA, MICH.—The Alpena Mutual Telephone Company has leased for five years all telephone property belonging to the Michigan State Company in this locality, including suburban lines, cables, etc. The Mutual Company will now complete lines to Spruce, Hubbard Lake and other towns.

ALMA, MICH.—The stockholders of the Shiawassee & Genesee Mutual Telephone Company have voted to connect with the Union Company of Alma for interchange service under the general plans adapted by the State Independents. The office of the company is located at Lennon.

GRAND RAPIDS, MICH.—The Grand Rapids-Wood County Mutual Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are L. E. Carson, G. H. Clantz, E. A. Hall, John McLain, L. S. Abbott, A. W. Nafus and Herman Greaf. The company is a consolidation of several small mutual companies near Grand Rapids and the incorporators are all residents of Wood County.

STURGIS, MICH.—The stockholders of the Southern Michigan Telephone Company have voted to increase the capital stock of the company to $300,000—the present capital being $60,000. The proceeds from the sale of the additional stock are to be used for the improvement and extension of the system. The system now covers an area of 360 square miles and includes 827 subscribers, seven exchanges and 21 toll stations. The directors are A. C. Himebaugh, Chas. A. Sturges, Geo. S. Sheffield, R. L. Himebaugh and R. C. Himebaugh.

MOSCOW, MINN.—The Austin Telephone Company will build a direct line from here to Oakland.

MINNELAKE, MINN.—The Valley Telephone Company, of this city, has been incorporated with a capital of $5,000.

WINONA, MINN.—The Winona Telephone Company plans to extend its lines in this city and install considerable cable service.

WILMAR, MINN.—At a meeting of the Minnesota Central Telephone Company, the following officers were elected: President and treasurer, D. N. Tallman; secretary, John Williams.

ESDAILE, MINN.—The Northeast Trenton Telephone Company has been organized with the following officers: President, Ole Erickson; vice-president, S. S. Reitan; secretary, Martin Shelstad; treasurer, Mr. Eidem.

MINNEISKA, MINN.—The Valley Telephone Company has been incorporated, with a capital stock of $5,000. The officers are: President, Frank Hartmann; vice-president, Fred Zimmerman; secretary and treasurer, M. A. Callahan.

BUTTE, MONT.—The Rocky Mountain Bell Telephone Company will place its wires in conduits.

GLENDIVE, MONT.—E. A. Hess, of Chicago, was the lowest bidder for 72 miles of telephone line for the irrigation project, at $212 a mile.

HELENA, MONT.—Lieut. Governor Edwin Norris and former Gov. B. F. White and others of Beaverhead County, have incorporated the Southern Montana Telephone Company for the purpose of constructing a telephone line from Bannock to Wisdom in that county.

HARPER, MO.—The Western Rural Telephone Company, of this city, has been incorporated with a capital of $1,600.

ST. JOHN, MO.—The Greenridge Mutual Telephone Company, of this city, has been incorporated with a capital of $1,200.

MILAN, MO.—The Milan Telephone Company, of Milan, was incorporated June 9 with a capital stock of $2,000. The incorporators are J. C. Belshe, Ada L. Belshe, Eva P. Belshe, Otta Belshe and Vivian Belshe.

ADVANCE, MO.—The Castor Valley Telephone Company, of Advance, has been incorporated, with a capital stock of $3,000. The incorporators are J. B. McKee, J. M. Watkins, C. A. Schonhoff, Nathan Lloyd, M. W. Ireland and others.

ALTAMONT, MO.—G. E. Dice has under consideration the building of a new telephone system at this place with lines reaching into neighboring towns and into the farming communities adjacent to Altamont. A number of farmers are becoming interested in his scheme.

JERSEY CITY, N. J.—The Erie Railroad has installed and is now operating a new telephone system in the Jersey City, Bergen and Weehawken yards.

ERMA, N. J.—The Citizens' Local Telephone Company has been incorporated, with a capital stock of $10,000, by Edward A. Wells, H. V. Soults and Luther Ingersoll, of Erma, and ten others. The company is to construct and maintain telephone lines and manufacture and deal in telephone supplies.

SOUTHPORT, N. Y.—The Southport Telephone Company, of this city, has been incorporated with a capital of $2,500. The incorporators are Wisner J. Roy, W. G. Samburger and others of Southport.

OSWEGO, N. Y.—The Volbey Telephone Company has been incorporated with a capital of $500. The incorporators are: President, Robert Simpson, Jr.; secretary, E. Rowe, and others.

ONEONTA, N. Y.—A force of fifty men, under the direction of Engineer Edward Cline, of the Utica Home Telephone Company, has begun the work of constructing the new independent telephone lines at Oneonta.

ALBANY, N. Y.—The Middletown Telephone Company, which was recently incorporated, has elected officers as follows: President, M. C. Conner vice-president, Edwin Fancher; treasurer, L. W. Post; secretary, W. C. Ramsdell. The directors of the company are: Edwin Fancher, J. B. Heulett and M. C. Conner.

MT. GILLARD, N. C.—The Mt. Gillard Telephone & Electric Company has been incorporated with a capital of $25,000. The incorporators are J. B. Blair, A. H. Regand and others.

WILTON, N. D.—The Missouri Valley Telephone Company, of Mandan, will install a local exchange.

GLENDIVE, MONT.—The following are the bids opened June 1 at the office of H. N. Savage, supervising engineer, U. S. Reclamation Service, Glendive, for the construction of a telephone system having four telephone stations and about seventy miles of pole line from Glendive to a point opposite Buford, N. D.: Elmer A. Hess, Lyons, Iowa, $14,939; William F. Jordan, Glendive, Mont., $16,986; Frank C. Hughes, Glendive, $17,840; W. H. Crumb & Co., Chicago, Ill., $18,615, and Burrell Construction Company, Portland, Ore., $23,710.

WELLINGTON, OHIO.—The Wellington Telephone Company has certified to an increase of capital stock from $20,000 to $30,000.

TOLEDO, OHIO.—The directors of the Toledo Home Telephone Company have declared a 1 per cent quarterly dividend payable on July 10.

SHELBY, OHIO.—The Shelby Telephone Company has been incorporated with a capital stock of $60,000. The incorporators are Edwin Mansfield, G. M. Skiles, J. F. Laming, T. J. Green and Harry Sotzen.

NEW CARLISLE, OHIO.—The New Carlisle Telephone Company has been incorporated with a capital stock of $25,000. The incorporators are C. D. Shelton, E. C. Miller, R. B. Hoover, E. A. Reed, T. P. Sylvan.

MT. STERLING, OHIO.—The Home Telephone Company has been incorporated with a capital stock of $15,000. The incorporators are W. H. Alkire, N. A. Riggin, G. M. Fisher, H. L. Cook and F. V. Sylvan.

COLUMBUS, OHIO.—The Perry County Telephone Company has been incorporated with a capital stock of $35,000. The incorporators are John Amberge, T. M. Potter, Henry Stefen, M. E. Joyce and J. A. Wright.

HOLLAND, OHIO.—The Holland Home Telephone Company has been incorporated with a capital stock of $5,000. The incorporators are Harry W. Lloyd, Edgar C. Hampton, John A. Belford, James R. Klepfer and Harry E. Duguid.

TOLEDO, OHIO.—The Northern Ohio Telephone Company has been incorporated, with a capital stock of $100,000. The officers are: President, Willard F. Robison; vice-president, H. M. Perrin, of Maumee; treasurer, James S. Brailey, Jr.; secretary, Charles F. Chapman; directors, the foregoing, together with N. L. Hanson, of Perrysburg; T. H. Tracy, Clarence Brown and M. G. Bloch.

SNYDER, OKLA.—The Snyder Telephone Company has been incorporated, with a capital stock of $5,000.

ORLANDO, OKLA.—A charter has been issued to the Fairview Telephone Company, of this city, to operate in Payne and Noble counties.

FOREST GROVE, ORE.—The County Commissioners have granted a franchise to Christian Riehen to construct a telephone line.

NEW CASTLE, PA.—The Covert Telephone Company, organized among farmers in Union township and North Beaver township, has opened its line for use. The officers of the company are: President, H. B. Chambers; secretary, J. V. Brewster; treasurer, George Gibson.

STROUDSBURG, PA.—The Sugar Hollow wire fence telephone line is now in successful operation from McMichaels, five miles away. Farmers living in the western part of Monroe County built it for their own convenience. The line has no stockholders, no superintendent, nor officers of any kind. Everybody is perfectly free to use it, repair it, extend it and regard it as his own.

MILBANK, S. D.—At a meeting of the Grant County Telephone Company, Mr. Roberts was appointed a committee to consult with the Tri-State Telephone Company as to the matter of connecting with them either at Big Stone City or Milbank.

CANYON CITY, TEX.—The Northwest Texas Telephone Company has increased its capital stock from $10,000 to $20,000.

FORT WORTH, TEX.—The independent telephone line in Hood and Somervell counties, embracing 140 miles of lines, has been purchased by the Southwestern Telephone & Telegraph Company. It is understood the deal will give a reduction of tolls from Fort Worth and Dallas to points in these counties from 40 to 25 cents.

RICHMOND, VA.—The Virginia Telephone Company had its annual meeting, when the present officers were re-elected. New stock has been subscribed, and the line is soon to be extended in the direction of Mannboro and Blackstone.

TACOMA, WASH.—The council has granted a franchise to the Sunset Telephone Company to place its wires under ground.

PRESTON, WIS.—The Annaton Preston Telephone Company has increased its capital from $3,000 to $6,000.

LENA, WIS.—The Bell Telephone Company has sold its line from Pound to Coleman to the Farmers & Merchants' Telephone Company, of Lena.

MADISON, WIS.—The Assembly has adopted a resolution for a constitutional convention and passed a bill taxing telegraph and telephone companies on an ad valorem basis.

CASCO, WIS.—The Casco & Brussels Telephone Company has increased its capital stock from $1,500 to $3,000. The president of the company is W. P. McGrath and the secretary Joseph Nemitz.

FORSYTH, WYO.—W. H. Walling, of the Sheridan (Wyo.) district is working up the matter of telephone connection with that city. The line will be about 60 miles long and cost about $2,000.

MONTREAL, QUE.—At a meeting of the directors of the Bell Telephone Company of Canada, held in Montreal on May 31, and acting under the powers conferred upon the directorate by the shareholders at the special meeting in December, 1900, it was decided to increase the capital of the company from $8,000,000 to $9,000,000. Each stockholder of record on June 15, 1905, is entitled to take, at $125 per share, shares of the new stock in the proportion of one share for every eight shares now held by him.

## Electric Light and Power.

BLANCHE, ALA.—S. W. Henderson, of Durango, Col., writes that there is a movement on foot to construct a power plant at Blanche, but nothing definite has yet been done.

LITTLE ROCK, ARK.—The Warren Light & Water Company has been incorporated, with a capital stock of $20,000. The incorporators are Fred L. Purcell, W. J. Savage and Carl Hollis.

ROGERS, ARK.—The Rogers Light & Water Company has been granted a charter. The capital stock is $100,000 and the incorporators are W. B. Felker, F. E. Freeman and J. E. Felker.

SANTA ANA, CAL.—It is stated that bids will be received by Edw. Telford, city clerk, until July 3 for $57.000 electric light bonds.

VENTURA, CAL.—C. E. Moore, of Santa Clara, has been selected to prepare plans and estimates for water works and an electric light plant for Ventura.

SAN FRANCISCO, CAL.—Sidney Sprout, general manager of the Culiacan Electric Company, a San Francisco corporation, has returned from Culiacan, Mexico, where he was making arrangements for the installation of the first unit of the new lighting plant. This will carry the street lighting for which a contract has been closed. Babcock & Wilcox boilers, an Ideal engine and a General Electric 100-kw, 3-phase generator will be shipped within a few weeks by steamer from San Francisco, and the entire system will be in operation by September 1. Negotiations have been in progress for the purchase of the small electric plant now in operation on commercial lighting.

SAN FRANCISCO, CAL.—At a special meeting of the stockholders of the Battle Creek Power Company, held June 5, it was voted to authorize an issue of 30-year bonds amounting to $1,000,000 for the purpose of carrying out the project of constructing an electric power transmission in Butte County, Cal. The company's complete plans are not ready for publication, but it is understood that the gold dredging districts, including Oroville, are expected to furnish a market for a part of the electric power to be developed by a modern hydroelectric plant. Dudley C. Bates is secretary of the company. Several electric railways which are projected in the same territory may be purchasers of power in time.

SAN FRANCISCO, CAL.—It is understood that the General Electric Company was the successful bidder for nine sets of heavy gold dredge equipment for the Boston Machine Shop Company, of Oroville, Cal. This concern installs the machinery for the gold dredges owned and operated by W. P. Hammon and his associates in the Oroville and Marysville gold-dredging districts. Most of this machinery will be placed in dredges to be constructed and operated on the Yuba River. The contract price is said to be in the neighborhood of $100,000 for San Francisco delivery. About 300 horse-power is required to operate each dredge. The equipment of each includes induction motors, ranging from 150 horse-power and 75 horse-power down to 20, 15 and 10 horse-power. Transformers and switchboards are also included in the contract.

WASHINGTON, D. C.—The Potomac Electric Power Company has secured the contract for arc lights in certain public parks at $85 per light per year, or a total of $5,525.

CARTERSVILLE, GA.—The Etowah Power Company, of Gainesville, has purchased the property of the Etowah Development Company, with the privilege to develop the water power of Etowah River. It is stated that a survey of the property will be made at once. W. A. Carlisle, of Gainesville, is the engineer.

MONTICELLO, GA.—The town of Monticello has authorized by vote a bond issue of $30,000 for electric lights, water and sewerage.

PANA, ILL.—The Pana Gas & Electric Company has been incorporated by T. F. Russell, Wm. Pierce and others.

MONTPELIER, IND.—The Montpelier Light & Water Company has been incorporated, with a capital of $75,000. The directors are: T. J. Driscoll, P. C. Connors and others.

WAUKON, IOWA.—The electric light company proposes to construct a concrete dam, 200 ft. long and 20 ft. high.

VALLEY JUNCTION, IOWA.—The Valley Junction Water & Light Company has been incorporated, with a capital of $12,000. John Fisher is one of the incorporators.

CHETOPA, KAN.—The proposed water works and electric light plant will cost $29,500. No engineer has been selected yet. A. R. Bell is city clerk.

ELKTON, MD.—Engineer B. F. Graff, an agent for Wm. T. Warburton, of Elkton, has purchased the mills and water power at Gilpins Falls, near Bayview, which will be developed for illuminating and manufacturing purposes.

WOBURN, MASS.—The Woburn City Council has passed over Mayor Reade's veto an order transferring the franchise of the Woburn Light, Heat & Power Company to the Edison Illuminating Company.

HOLYOKE, MASS.—Treasurer R. C. Winchester, of the Holyoke Water Power Company, has received permission from the River and Harbor Commission for the use of a part of the river bed for a site for the new electrical generating power plant. The force of engineers has begun preliminary work on the proposed site.

CHICOPEE FALLS, MASS.—The J. Stevens Arms & Tool Company, of Chicopee Falls, is planning to develop the power from the old mill dam on Parker Street in Sixteen Acres to generate electricity to operate the Hill plant of the company at the Falls. The dam will provide something like 300 horsepower if fully developed.

JACKSON, MICH.—The directors of the Capital Light & Power Company have decided to expend about $8,000 for new machinery.

ST. CHARLES, MO.—The St. Charles Lighting Company has been incorporated, with a capital of $150,000, by Joseph McCollum, Lloyd Shepard, of East St. Louis, Ill., and others.

MARSHALL, MO.—The Marshall Light, Heat & Power Company of New York has filed articles to show that it had been incorporated under the laws of that state, with a capital stock of $150,000, all of which is to be employed in Missouri. The company's office will be in Marshall.

ST. CHARLES, MO.—The St. Charles Lighting Company was incorporated May 31, with a capital of $100,000. The incorporators are Joseph McCollum, Lloyd Shepard, Charles F. Johnson and Robert H. Lawlor, of East St. Louis, Ill.; Edward Gut, S. O. Fulkerson and C. O. Collier.

LINCOLN, NEB.—Bids will be received by James Knox Taylor, supervising architect of the Treasury Department, Washington, D. C., July 11, for installation of a conduit and electric wiring system for the U. S. Court House and Postoffice at Lincoln.

RENO, NEV.—The Reno Light, Power & Water Company has announced a cut of 75 per cent in its electric lighting rate. This is against the Washoe Power & Development Company, which will turn on current in a few days. The new company is expected to meet the reduction. Recently the Washoe Company offered to furnish current free for the carnival to be given next July, and now the old company comes with an offer to furnish lamps, wires, current and all labor free. Both are wealthy corporations.

KEENE, N. H.—The Citizens' Electric Company has closed contracts with the Westinghouse Company for machinery and apparatus to equip a new power and electrical plant in this city.

CONCORD, N. H.—The Concord Electric Company has closed contracts for the enlargement of its Sewall's Falls plant, and as soon as the work is completed will begin to furnish all the electric power for the operation of the street car lines, an agreement to that effect having been reached with the Boston & Maine Railroad.

LACONIA, N. H.—The Committee on Street Lighting of the City Council has taken the preliminary steps for the lighting of The Weirs end of the city by electricity. Already the Laconia Lighting Company, which has a ten-year contract with the city for street lighting, has the work of stringing the wires to the lake well under way. For the first year some twenty-two lamps have been allotted.

DEAL, N. J.—The Elberon Water, Power & Light Company, of Elberon, has secured a franchise to lay mains and conduits for lighting and other purposes in Deal.

HIGHLANDS, N. J.—Bids will be received by the Mayor and Council June 26 for the construction of water works and an electric light plant. Tunis H. Lane is borough clerk.

JERSEY CITY, N. J.—The Sioux City Service Company, of Jersey City, has been incorporated, with a capital of $250,000. The incorporators are Louis B. Dailey, Thomas F. Barrett and B. Stafford Mantz, all of Jersey City.

LOCKPORT, N. Y.—The Niagara, Lockport & Ontario Power Company has purchased a site for the $100,000 transformer station.

OLEAN, N. Y.—The Natural Gas, Electric Light, Heat & Power Company has been formed; capital, $50,000. Directors: W. R. Page, F. R. Easton and J. L. Page, Olean.

BUFFALO, N. Y.—The Oatka Power & Transmission Company has been incorporated; capital, $50,000. Directors: E. M. Bartlett, H. W. Putnam and J. J. O'Brien, Buffalo.

TONAWANDA, N. Y.—The Tonawanda Power Company has secured the contract for lighting the streets and parks with 120 arc lamps for 5 years, at $70 per lamp per year.

OTSEGO, N. Y.—The Otsego Transmission Company has been incorporated; capital, $40,000. The incorporators are: William W. Capron and William H. Smith, of Oneonta, and others.

ALBANY, N. Y.—The Economy Light, Fuel & Power Company has been formed to operate in Lockport, Buffalo and other places in Erie and Niagara counties, with a capital of $250,000.

POTSDAM, N. Y.—The Hydraulic & Electrical Power Company has been incorporated with a capital stock of $50,000. The directors are G. W. Sisson, R. L. Sisson and C. H. Sisson, of Potsdam.

ALBANY, N. Y.—The Mountain Light & Power Company has been organized with a capital of $50,000. Incorporators: Howard Hendrickson, William A. Hendrickson, James E. Carhart, Albany.

BINGHAMTON, N. Y.—The Binghamton Light, Heat & Power Company has secured the contract for 366 or more incandescent street lights of not less than 32-candle-power at $21.50 per light per year.

TROY, N. Y.—The Board of Contract and Supply is considering the question of establishing a municipal electric light plant to be used for lighting Monument Square and city buildings in that locality.

WATERTOWN, N. Y.—The Jefferson County Gas & Electric Company has been incorporated; capital, $100,000. The incorporators are: John B. Taylor, Fred B. Pitcher and B. J. McCarthy, all of Watertown.

CASTLETON, N. Y.—The Castleton Light, Heat & Power Company has been incorporated; capital, $25,000. The incorporators are: Joel D. Smith, Thomas E. Clifford and Frank H. McKnight, of Castleton.

LOCKPORT, N. Y.—The Niagara, Lockport & Ontario Power Company has filed with the clerks of the counties of Erie, Monroe, Orleans, Seneca, Wayne, Ontario, Cayuga and Onondaga certificates of extension of business in these counties.

SCHENEVUS, N. Y.—The Albany, Susquehanna Valley & Binghamton Power Company has been formed to furnish electric light, heat and power; capital, $75,000. Incorporators: Melvin Baldwin, John Graney, Schenevus; George Brooks, Cooperstown.

NEW ROCHELLE, N. Y.—The Empire State Gas & Electric Light Company has been incorporated, with a capital of $50,000, to operate in Westchester County. The directors are: William H. Cooper and N. Raymond Fox, of New Rochelle, and Charles J. Van Slyke, of New York City.

DEXTER, N. Y.—The Dexter Electric Light & Power Company has been formed to furnish light and power in various towns and villages in Jefferson County; capital, $100,000. Directors: Edward Hunter and Catherine J. Hunter, Dexter; Celestin C. Burns and George H. Burns, Watertown.

MOREHEAD CITY, N. C.—Bids will probably be received in July for the construction of water works and an electric light plant.

PLYMOUTH, OHIO.—It was voted June 1 to issue $6,000 bonds to improve the water works and electric light plant. W. A. Jeffrey is village clerk.

YOUNGSTOWN, OHIO.—Bids will be received until June 19 by the Board of Public Service for a complete electric light plant for the water works pumping station and filter plant. G. T. Prosser is clerk.

NEWARK, OHIO.—The Westinghouse Electric & Manufacturing Company has secured the contract for generator, switchboard, arc lamps and regulating transformer for the municipal electric light plant for about $12,510.

NEW STRAITSVILLE, OHIO.—H. L. Canfield, treasurer Delphos Electric Light & Power Company, Delphos, O., has secured franchises for operating an electric light and power plant at New Straitsville and transmitting current to Shawanee, two miles distant. A complete new installation throughout will be erected and modern equipment installed. Bids on poles, wires and general construction materials, as well as boilers, engines and alternators, including series alternating-current arc lamps, will be received at Delphos.

ANADARKO, OKLA.—The municipal lighting plant of Anadarko, just completed by the El Reno Light & Power Company, and costing $11,000, was started on the evening of June 4 and the city is now lighted by 28 arc lights. The plant was installed in the water works power house.

ASTORIA, ORE.—W. W. Whipple has accepted the franchise granted by Council for the purpose of building a telephone, gas and electric light plant in Astoria.

YORK, PA.—The Baltimore & Susquehanna Canal Power Company, of Baltimore, Md., and the York Furnace Power Company, owned by George B. Wilson and associates, of Lancaster, have been consolidated, and the proposed power plant on the lower Susquehanna River in York County will probably be constructed this summer.

DALLASTOWN, PA.—The York & Windsor Electric Light Company has engaged as manager F. C. Wright, recently superintendent of the Lebanon (Pa.) Edison Company. The Dallastown station has an output of 800 kw and supplies eleven towns in York and Lancaster counties. Eli L. Nissly is president and E. R. Heisey secretary and treasurer.

CENTRAL FALLS, R. I.—The City Council has passed an ordinance appropriating $75,000 for the purchase of a site and the construction of a municipal electric light plant.

CONWAY, S. C.—A charter has been granted to the Conway Light & Power Company, with a capital of $10,000. D. A. Spevay is president.

GREENVILLE, S. C.—J. F. Grandy & Sons have secured the contract for constructing the dam for the Saluda River Power Company. Orders for machinery and electrical apparatus are reported to have been let.

COOKEVILLE, TENN.—Bids will be received by the town council June 22 for furnishing material and constructing water works and an electric light plant.

NASHVILLE, TENN.—The Southern Electric Company has increased its capital from $20,000 to $40,000 and will enlarge its plant. O. C. Turner is general manager.

DEL RIO, TEX.—The Del Rio Electric Light & Ice Company has been incorporated, with a capital stock of $200,000. The incorporators are J. G. Darden, of Jericho, Donley County; John M. Gray, of Del Rio, and Maynard Gunsul, of Alberquerque, N. M.

STAUNTON, VA.—The Blue Ridge Light & Power Company has been incorporated at Staunton by John M. Spotts, president and treasurer; C. P. Bowman, secretary and vice-president. The capital stock is $50,000, and the concern has the right to operate a railroad with any kind of power desired.

BRISTOL, VA.—The Lake Dunmore Power & Traction Company has absorbed the Bristol Electric Company and has plans for putting in a thirty-foot high dam in New Haven River and another 1,500 feet above the present electric plant dam; also the putting in of a large steam engine at the plant for use in case of low water. The village of Bristol has authorized its trustees to make a five-year contract with the company to light the streets.

RICHMOND, VA.—A move is on foot for the city to operate and maintain an electric light plant. The Virginia Passenger & Power Company now furnishes the light for the city, and this is one of the big assets of the company. The attorneys for the road, it is stated, are not fighting the new municipal light scheme further than to undertake to demonstrate to the council that it is not to the city's interests at this time to go into such a project.

GARDEN CITY, UTAH.—The Council is considering issuing bonds for the construction of an electric light plant.

SUMAS, WASH.—H. W. Vanderhoof has asked the City Council for an electric lighting plant franchise.

FORT MACKENZIE, WYO.—Bids will be received until June 19 by Capt. James S. Parker, Quartermaster, U. S. A., Sheridan, Wyo., for installing an interior and exterior electric lighting system at Fort Mackenzie.

PETERBORO, ONT.—An electric generator of 12,000 horse-power has just been turned out by the Canadian General Electric Company at Peterboro for the Ontario Electrical Development Company, being one of a series.

## The Electric Railway.

SAN FRANCISCO, CAL.—Three hundred thousand dollars has been set aside in the budget for the coming year for the conversion of the Geary Street Cable Railroad into an underground electric conduit road. The total cost has been estimated at $667,595. This is the first step in the acquirement of this road as a public utility, its franchise having expired, and its operation under public ownership.

HARTFORD, CONN.—The Legislature has passed the bill permitting the East Hartford & Glastonbury Street Railway Company to increase its stock to $1,000,000 and extending to July 1, 1907, the time for extensions in Glastonbury. A bill has also been passed authorizing the Hartford Street Railway Company to increase its stock to $5,000,000 and extending to July 1, 1907, time for extensions in Wethersfield and Rocky Hill.

HARTFORD, CONN.—It is announced that the New York, New Haven & Hartford Railroad proposes to experiment on its lines between this city and Rockville with the operation over the same tracks of both steam trains and electric cars. Trolley wires will run over the railroad between Rockville and Vernon, and over each track of the double-tracked main line between Vernon Station and some point in East Hartford, there to connect with the Hartford Street Railway, over whose lines the cars will run into Hartford.

JACKSONVILLE, FLA.—The Jacksonville Suburban & Seashore Railroad Company has been organized for the purpose of constructing an electric railway from this city to or near Pablo Beach. The amount of capital stock is placed at $300,000. The officers are as follows: President, John D. Lawrence; secretary and treasurer, William A. Riddle.

LEWISTON, IDAHO.—The City Council has granted to Colonel Judson Spofford a franchise for an electric street railway system to be operated in connection with the independent Lewiston-Grangeville Electric railway.

CHICAGO, ILL.—The Chicago & River Forest Railway Company, principal office Chicago, has been incorporated with a capital stock of $10,000, to be constructed from Oak Park, Cook County, Ill., in westerly direction to a point in Du Page County, Ill. The incorporators are George W. Bryson, Frederick W. McLean, William J. Kenly and others, all of Chicago.

COLUMBUS, IND.—The Columbus Street Railway & Light Company will receive bids for the construction of a new power house and a central steam heating plant.

PORTLAND, IND.—The City Council has granted a franchise to the Fort Wayne & Springfield Traction Company and the line will be extended from Decatur to Portland.

COLUMBUS, IND.—The Columbus Street Railway & Light Company will build a power house on Sycamore Street. With the new power house will be combined a central steam heating plant.

GOSHEN, IND.—H. E. Bueklen announces that he has decided to build his Valley Line interurban railway east from Lagrange and has the line almost surveyed from Lagrange to the Ohio State line.

HUNTINGTON, IND.—The Huntington, Upland & Matthews Traction Company has been incorporated. O. S. Stout, J. A. Shafer, D. L. Horner, C. W. Reed, H. R. Miles, C. F. Knowlton and A. Y. Stewart are directors and promoters.

INDIANAPOLIS, IND.—The promoters of the Indianapolis & Chicago Air Line Traction Company announce their purpose of entering this city on elevated tracks in Cornell Avenue, with its own terminal station at Court and Alabama Streets.

SHELBYVILLE, IND.—Enos Porter, of this city, is promoting a new line from Shelbyville to Greensburg, which would be in effect an extension of the Shelbyville line. The promoters of the new line will ask for subsidies along its route.

LAPORTE, IND.—The South Bend Western Railway Company has been incorporated with a capital stock of $100,000. The officers are: President, W. L. Taylor, Indianapolis; vice-president, M. H. Reed, South Bend; secretary, W. W. Babcock, South Bend.

HUNTINGTON, IND.—The recently organized American Engineering Company, of New York, has closed a contract with the Huntington, Columbia City & Northwestern Traction Company for the construction and complete equipment of the proposed lines of the latter company, from Huntington to Goshen and eventually to South Bend. The contract represents work to the value of about $1,500,000.

LAPORTE, IND.—The South Bend Western Railway Company, with a capital stock of $100,000 and backed by the Indiana Railway Company, which owns a system of interurban lines in northern Indiana and southern Michigan, and is controlled by the Kennedy syndicate, of New York, has filed articles of incorporation. The company will construct an electric railway from Laporte to South Bend, 28 miles, and a connecting line from New Carlisle to Michigan City, 16 miles.

INDIANAPOLIS, IND.—The sale of the Indianapolis & Martinsville Rapid Transit Company has been finally consummated and the property passed to the control of the Stone & Webster syndicate of Boston. The consideration is something over $600,000, and the basis of the purchase was 20 cents on the dollar of stock, with the taking over of one-third of the bonds by the purchasing company. The capital stock of the company is $750,000 and its bonded indebtedness the same. The new interests have been legalized by

the election of a new board of directors, Henry R. Hays, J. H. Oakes, W. A. Carter and Elliott Wadsworth of Boston being added to the Board.

ABILENE, KAN.—Plans to build an electric railway from Abilene to Fairbury, Neb., to take in Clay Center and Washington, are almost completed by capitalists here. It will be called the Golden Belt Electric line, and a charter will be secured in a few days.

HAGERSTOWN, MD.—A franchise to construct an electric railway has been granted to John W. Feldman.

WEST BROOKFIELD, MASS.—The Hampshire & Worcester Street Railway, which ceased operation when it went into the hands of a receiver four months ago, has resumed business.

DETROIT, MICH.—It is stated that the work of developing power along the Huron River and the lake region north of Dexter, Mich., is being done in the interest of the Michigan Central Railroad. It is proposed by the Michigan Central to build a monster dam across the Huron River at a little hamlet called Hudson, between Dexter and the string of lakes. Here a huge power house will be erected and power furnished to the Michigan Central for operating its trains both east and west of Ypsilanti.

SEDALIA, MO.—The property and franchises of the Sedalia Water & Light Company, the Street Railway Company, and the Sedalia Gas & Fuel Company, owned by a St. Louis syndicate, were sold June 1 to a syndicate of Boston and New York capitalists for $750,000. The new owners propose to expend $500,000 in improvements during the present year, $200,000 of which is to be for needed street railway extensions and improvements.

TRENTON, N. J. — The Northumberland County Railway & Light Company, in which Philadelphia capitalists are interested, has been incorporated at Trenton, N. J. The authorized capital is $1,000,000, of which $500,000 is preferred, bearing 5 per cent. cumulative dividends. The balance of the stock is common. The company is to supply gas and electric light for cities and to construct outside of New Jersey railroads for the transportation of passengers and freight. The incorporators are Wilbur F. Sadler, Jr., Trenton, N. J., and William W. Hepburn and George Parkman, both of this city.

NIAGARA FALLS, N. Y.—The Niagara, Dunville & Erie Electric Railway has been authorized to build a line from St. Catherines to Dunville and Port Dover and to establish a rural telephone service.

SYRACUSE, N. Y.—The Syracuse Common Council has provided for the sale at auction of a franchise for a single or double-track street railway through Stolp Avenue from South Geddes Street to the city line. This franchise is for an extension of the route for which a franchise was last year granted to the Syracuse Rapid Transit Railway Company.

NEWBURG, N. Y.—The Upper Hudson Electric & Railroad Company of Newburg has been incorporated to operate an electric railway 25 miles long from the terminus of the United Traction Company, of Albany, in the town of Bethlehem to the village of Catskill; capital, $500,000. Directors: Luke F. Gillespie, J. M. Sheehan, Athens; T. M. Sheehan, Coxsackie; N. W. Dalton, Thompsonville, Conn.; F. J. Curnick, New York.

WILMINGTON, N. C.—The Buck Shoals Company, of Arden, Henderson County, N. C., has been chartered, with $20,000 capital, to conduct a large variety of businesses, including the operation of electric railways. J. W. Sluder, of Asheville, is interested.

AKRON, OHIO.—The Akron & Medina Railway Company has applied for a franchise in Medina. The route has been advertised.

PLYMOUTH, OHIO.—Work has been started on the erection of the power station of the Sandusky, Norwalk & Mansfield Railway Company at this place. The Cuyahoga Construction Company, Cleveland, is the engineer.

CINCINNATI, OHIO.—The Cincinnati, Milford & Loveland Traction Company will increase its bonded debt by an issue of $500,000 30-year bonds, of which $275,000 will be issued for the extension of the road to Blanchester.

CINCINNATI, OHIO.—The Cincinnati, Toledo & Detroit Short Line Railway, which is projected by J. Morgan, of Toledo, is said to be negotiating for the purchase of the Cincinnati & Westwood Railroad, a suburban steam road, which would afford excellent entrance to Cincinnati.

WAUSEON, OHIO.—The Westinghouse Electric & Manufacturing Company is said to be preparing estimates for the construction of the line of the Ohio Northern Traction Company from Defiance to Wauseon. Eventually the road will be extended to Napoleon and on to Adrian, Mich.

DEFIANCE, OHIO.—The Defiance, Wauseon, Adrian, Ann Arbor & Detroit Traction Company has been incorporated to build a line between the points mentioned in the title. The incorporators are: W. W. Campbell, C. E. Bennett, J. H. Miller, N. P. Penrod, K. Z. Haymaker and F. J. Spencer.

TOLEDO, OHIO.—The Patrick Hirsch Construction Company, which is financing the Toledo, Ann Arbor & Detroit Traction Company, has awarded a contract for construction work to the Fidelity Construction Company, of Detroit. The section from Toledo to Ann Arbor, forty-three miles, will be built first.

LIMA, OHIO.—The promoters of the Lima & Toledo Railway have changed the route of the northern section of the road so that it will run to Bowling Green by way of Weston and enter Toledo over the tracks of the Toledo, Bowling Green & Southern, thereby saving the cost of building about twenty-five miles of road.

TOLEDO, OHIO.—The Toledo & Chicago Interurban Railway Company has increased its capital from $400,000 to $1,250,000. The company is being promoted by the people who built the Toledo & Western, and the line is to extend west from the terminus of the Toledo & Western at Pioneer. F. B. Perkins, of Toledo, is chief engineer of the road.

AKRON, OHIO.—It is stated that the Westinghouse Electric & Manufacturing Company is preparing plans and specifications for the equipment of the Cleveland, Akron & Southern Fast Line. The road was projected two years ago by T. L. Childs, of Akron, but was held up owing to his inability to secure entrance to either of the terminal cities.

SPRINGFIELD, OHIO.—E. D. Evans, of the Detroit Electric Vehicle Company, is organizing two companies here, each with $50,000 capital stock, to enter new territory undeveloped by traction lines. One route will be from Springfield through Clifton, Cedarsville and Jamestown, and the other through Catawba, Mechanicsburg, Milford and Marysville. Electric 'buses will be used.

CLEVELAND, OHIO.—The Standard Engineering Company, of this city, has the contract for extending the line of the Columbus, New Albany & Johnstown Traction Company, of Columbus, from Gahanna to Johnstown, a distance of seventeen miles. Work of grading will start at once. Two sub-stations will be erected and power will be rented from the Columbus Railway & Light Company, as at present. Additional rolling stock will probably be purchased.

TOLEDO, OHIO.—Stockholders of the Toledo & Western Railway will meet June 24 to vote on a proposition to increase the bond issue on the property from $1,800,000 to $2,500,000 and to increase the capital stock in the same proportion. The plan is to issue $1,500,000 bonds to retire underlying issues, $400,000 to be sold for the purchase of additional power equipment and rolling stock and the remaining $600,000 bonds to be retained for future requirements.

CLEVELAND, OHIO.—The Cleveland, Ashland & Mansfield Traction Company will shortly be incorporated with $1,000,000 capital stock to build an extension of the Cleveland & Southwestern from Chippewa Lake to Ashland and Mansfield. It is stated that plans for financing the project have practically been completed. Interests in Ashland and Mansfield will take a large block of securities, while the balance will be taken by the Pomeroy-Mandelbaum interests, which own the Cleveland & Southwestern.

CINCINNATI, OHIO.—It is stated that the Cincinnati Car Company, controlled by the Widener-Elkins syndicate, has been sold to the street car building combination now in process of formation. The statement is to the effect that the deal has been made through Geo. J. Kobush, president of the St. Louis Car Company. Mr. Kobush, when questioned in St. Louis, admitted that the consolidation of car manufacturers is again pending, but refused to commit himself as regards the reported purchase of the Cincinnati plant.

CLEVELAND, OHIO.—Cleveland owners of the Kansas City & Leavenworth Electric Railway have formally disposed of the majority of their holdings to New York and Kansas City parties represented by C. S. McClellan, of Mount Vernon, N. Y. New officers have been elected as follows: C. F. Homes, Kansas City, president; C. F. Hutchins, Cleveland, vice-president; S. D. Hutchings, Cleveland, secretary-treasurer. Together with the above, the board of directors consists of Arthur Pack, of Detroit; G. W. Gowanlock and M. H. Wilson, of Cleveland; J. H. Thompson and S. E. Johnson, of New York. It is stated that important improvements will be made to the property and that a portion of it will be double tracked.

MT. PLEASANT, PA.—Town Council has granted a franchise to the Uniontown & Monongahela Electric Railway Company, a constituent company of the West Penn Railways Company. It is stated that a new route to Greensburg, connecting Hecla and Youngwood, will be built.

NEW CASTLE, PA.—The Western Pennsylvania Motor Power Company has just been chartered to build electric railway lines in Mercer, Lawrence and Butler counties. The capital is nominally $10,000, but several times that amount is to be expended in constructing trolley lines. The main offices will be located here.

CHATTANOOGA, TENN.—A franchise to build an electric railway on several streets has been granted to J. W. Adams.

NASHVILLE, TENN.—The Gallatin & Suburban Railway, of Sumner County, Tenn., has been chartered, with $50,000 capital, by C. H. Fidler, G. N. Guthrie and several others.

CLARKSVILLE, TENN.—The Clarksville Railway & Light Company has executed to the United States Trust Company, of Louisville, Ky., a mortgage for a sum not exceeding $200,000, to secure the issuance of $40,000 for more improvement bonds, and is for forty years at 5 per cent. It is understood that the plans of the company include the extension of the electric car line to New Providence and Dunbar's Cave, and also the overhauling of the entire system.

GAINESVILLE, TEX.—Edward J. O'Beirne says that the Gainesville Electric Railway & Light Company, of which he is president, has purchased the plant of the Merchants' Electric Light & Power Company, of Gainesville, and will build an electric street railway at once. He desires prices on construction. His office is at 418 Scimitar Building, Memphis, Tenn.

SHERMAN, TEX.—Plans for constructing an interurban electric railway from Sherman to Gainesville, via Whitesboro, have been perfected. The promoters ask that Sherman citizens carry $25,000 of the company stock. Whitesboro is to take $10,000 and Gainesville $45,000, making a total of $80,000, which is 10 per cent of the estimated cost of construction and equipment. The principal promoter is C. A. Hassinger, of New Orleans.

OGDEN, UTAH.—Simon Bamberger, of Salt Lake City, has asked the City Council for a franchise for an electric railway.

NORFOLK, VA.—A syndicate has been formed at Norfolk to build an electric railway to connect the summer resorts of Ocean View and Pine Beach. The amount involved will be $300,000. The distance is five miles.

CHEYENNE, WYO.—Judge John Porter, of Iowa, is contemplating the construction of an electric railway system in this city.

MONTREAL, QUE.—The statement of the Montreal Street Railway Company, for the seven months of the company's fiscal year, shows gross earnings of $1,422,000, or a gain over the corresponding period a year ago of 9.54 per cent. Net earnings are $453,158, and operating expenses have increased 10.6 per cent and the fixed charges 11.45 per cent. The detailed earnings for April show an increase of $16,000 over the same month last year.

OTTAWA, ONT.—The Ottawa River Railway has received permission from the Dominion Parliament to build two branch lines. The lines will run from the town of Orillia to Port Stanley and from the township of Mara to Toronto.

PERTH, ONT.—The Perth & Huron Electric Railway has asked for incorporation by the Dominion Parliament. The company will operate from Stratford to Grand Bend and from Stratford to Tavistock. A clause was inserted providing that cars shall not be run on Sundays.

# New Industrial Companies.

THE STAUNTON AUTOMOBILE TRANSPORTATION CO., Staunton, Va., has been chartered by J. E. Porter and others, with $10,000 capital stock.

THE MERCANTILE BURGLAR ALARM TELEPHONE COMPANY has been formed in New York City. Capital, $3,000. The incorporators are Townsend H. Boardman, Joseph J. Young and others.

THE HATTIESBURG ELECTRIC SUPPLY COMPANY, of Hattiesburg, Miss., has been incorporated with a capital stock of $10,000. The incorporators are William T. Spranley, L. C. Reed and others.

THE KNAPP ELECTRIC & NOVELTY COMPANY, of New York, has been formed to deal in electrical novelties; capital, $50,000. Directors: D. W. Knapp, F. F. Thul, New York, and T. G. Grier, Chicago, Ill.

THE WHITE ELECTRIC COMPANY, of Buffalo, N. Y., has been formed and is capitalized at $1,000. It will deal in electric supplies with Henry G. White, Harry O. Kingston and Elsie L. White as directors.

THE ELECTRIC CONSTRUCTION COMPANY, of Hamilton County, Tenn., has been incorporated with a capital stock of $10,000. The incorporators are R. H. Williams, Geo. D. Lancaster, Norris Headrick, Bruce Forshee and Bartow S. Strange.

THE UNITED STATES WIRELESS TELEGRAPH COMPANY, of Oklahoma City, has been incorporated, with a capital stock of $3,000,000. The incorporators are W. H. Gilman, of Brooklyn, N. Y.; C. W. Hooper, of New York City, and J. H. Shirk, of Oklahoma City.

# Personal.

MR. W. S. HEGER.

MR. W. S. HEGER has joined the Allis-Chalmers Company, becoming assistant to the vice-president and general manager, with headquarters at Milwaukee. Born in 1857, at Fort Simcoe, U. S. Army Post, Washington Territory, Mr. Heger received his education both in this country and Europe, spending seven years in Vienna, Austria. His business career began in the mechanical draughting room of the Edgemoor Iron Works. In 1885 Mr. Heger went into business upon his own account as a contractor and electrical engineer and later became sales agent and constructor for the Edison Company for Isolated lighting in the States of Delaware, Maryland, the Virginias and the Carolinas. In 1889 Mr. Heger was sent to San Francisco as district manager for the Pacific Coast territory for the Edison Company and for the Edison United Mfg. Company. He built up the organization there which exists today under the General Electric Company and established a large and successful business. Owing to the serious illness of a daughter Mr. Heger gave up all business in the fall of 1890 and remained in retirement for two years. Resuming active work in 1892 he accepted the place of general manager of the Wilmington City Railway Company, Wilmington, Del., and spent three years there rebuilding and operating the road. Returning to the Pacific Coast again in 1895, Mr. Heger became the district manager for the Westinghouse Electric & Mfg. Company, with headquarters in San Francisco. He built up a strong selling organization and made a wide market for the products of his own company and those of the Sawyer-Man Company. At the beginning his territory covered the whole Coast country from Alaska to Old Mexico, and reached east as far as Salt Lake City. As business was developed, the territory was divided and district offices were opened at Seattle, Salt Lake City, Los Angeles and in British Columbia. Mr. Heger's work was marked particularly by his success in inventing methods to promote and secure sales in sparsely settled districts, and in securing the co-operation of affiliated lines of business. During Mr. Heger's administration the initial long-distance power transmission plants of the Pacific Coast were built, and in the construction of these many unlooked-for features had to be met.

MR. CHAS. S. DAVIS, for the past six years master electrician of the Bureau of Construction and Repair, Charlestown Navy Yard, has joined the engineering staff of the Holtzer-Cabot Electric Company, Boston, Mass.

MR. R. A. PHILIP, electrical engineer for the Stone & Webster properties, on June 7 read a paper before the Boston branch of the Institute, entitled "The Evolution of the Electric System as Exemplified by the Seattle Electric Company."

MR. GEORGE WESTINGHOUSE has been named as one of the new trustees of the Equitable Insurance Company, with ex-President Grover Cleveland and Justice O'Brien. This selection is a splendid mark of public esteem and confidence in the great engineer and inventor.

MR. R. BORLASE MATTHEWS, who has had considerable engineering and literary experience in this country and England, and was recently with the advertising department of the National Electric Co. has accepted a position in the publication bureau of the General Electric Co., at Schenectady, N. Y.

MR. T. D. BROWN has accepted the position of secretary with the Pusey Voltage Regulator Company, Fidelity Trust Building, Philadelphia. Mr. Brown, until recently, was connected with the Electro-Dynamic Company, and brings to his new position a wide experience covering a number of years in the electrical field.

MR. FRANK C. WRIGHT has resigned as superintendent of the Edison Company, of Lebanon, Pa., to accept the position of general manager of the York & Windsor Electric Light Company and the Elizabeth & Marietta Electric Light Company. These companies operate in eleven towns in York and Lancaster counties, Pa., and have an output of 800 kw, alternating current, single-phase and three-phase.

PROF. W. H. WILLIAMS has resigned his position as assistant professor of electrical engineering at the University of Illinois and will shortly enter the employ of the Hart-Parr Company, of Charles City, Iowa, makers of gas and gasoline engines, as its general sales manager. Prof. Williams has been a teacher for 15 years, the first six years as principal of a high school. He then took his engineering course at the University of Wisconsin, and upon graduation was made professor of electrical engineering at the Montana State College at Bozeman. From there he came to his present position in 1903.

MR. R. R. LANDON, of the Bryan-Landon Company, of Manila, P. I., is in the United States for a short time. He has in contemplation the purchase of an electric lighting plant for the city of Cebu, P. I. Apart from that, he will be glad to get into communication with manufacturers interested in finding a market for electrical specialties and supplies. This company is the successor to the Electric Construction Company, formerly in business in Manila, and has been in operation for about four years. In that time it has carried out a great deal of electrical installation. Communications may be addressed to Mr. Landon in care of this office.

PROF. ELIHU THOMSON.—Some wild and amusing stories have been given in the newspapers recently as to high voltage tests and displays made by Prof. Elihu Thomson. The real truth is given by Prof. Thomson in the following explanatory wail of despair which one can but echo with sympathy: "On the occasion of a visit of the Boston Commercial Club to our Lynn Works, as a matter of interest I happened to show a high frequency apparatus in action, and was asked if the discharges were dangerous. On the spur of the moment I took the discharge in accordance with the now old and well known demonstration and of course with no shock or other disagreeable effect. Some reporter got hold of the incident, and has filled the public press with sensational announcements, giving most garbled accounts of the incident. The result is that I have since been besieged by reporters and telegrams asking for photographs of the experiment and descriptive matter. The annoyance is great. It has come to a pretty pass when to avoid all this one must refrain even from simple experimental demonstrations, made entirely in the interest of scientific knowledge to one's own friends and associates. As if to add insult to injury the press clipping bureaus are sending in samples and asking if I do not want more of the same. God forbid!"

# Legal.

RECEIVER APPOINTED.—According to the Milwaukee papers, Judge Halsey has appointed John E. Reilly receiver of the Independent Consolidated Telephone Company, under a bond of $30,000. The appointment was made at the instance of J. P. Weirich, who commenced suit against the company several weeks ago. The Independent Consolidated Company is the largest independent telephone concern in the state, having 700 miles of wire and over 1,200 subscribers in Sauk, Richland, Iowa and Grant counties. It is expected that the business will be continued under the receiver. The corporation recently increased its capital stock from $100,000 to $200,000 and issued $70,000 in bonds. Many Milwaukeeans are stockholders, and they declare that the trouble had been expected for some time and that the company will not fight the receivership proceedings. The president and general manager of the company is A. L. Hutchinson, of Weyauwega, and N. W. Low, of Milwaukee, is secretary-treasurer. The headquarters of the company are at Dodgeville.

# Trade Publications.

COMMUTATOR LUBRICANT.—In a well-arranged miniature folder the L. B. Allen Company, Chicago, calls attention to its commutator lubricant, which comes in stick form and is applied to the commutator while in service.

UNIT ACCUMULATORS.—In bulletin No. 1, the National Battery Company, of Buffalo, N. Y., gives a complete and well illustrated description of the central energy telephone exchange of the Frontier Telephone Company, at Buffalo, where the battery in use consists of 22 elements of "unit" accumulators.

CHANGEABLE SIGN.—The Mobile Electric Company, Newark, N. J., has issued a well-illustrated catalogue dealing with the Mobile changeable signs for theaters, which were described in our issue for June 3. Views are given showing the pleasing effect of the signs as now used at the New York Hippodrome, the signs being equally attractive by day or by night.

THE WARD LEONARD ELECTRIC COMPANY, Bronxvile, N. Y., are issuing a reprint of their new catalogue covering motor field rheostats, No. 19,053. They have added cuts showing their enameled type field rheostat equipped with a no-voltage release protective device. This protective device effectually prevents the starting of the motor under condition of weakened field.

EVERBEST MAGAZINE.—With the above title the Ewin-Merkle Electric Company, 1106 Pine Street, St. Louis, is sending forth each month a magazine which is stated to be "devoted to things electrical and to those people who want to get a little good wisdom combined with a little good fun." The publication is attractive in appearance and the information therein is set forth in an entertaining manner.

SWITCHBOARDS.—The F. Bissell Company, Toledo, Ohio, has issued the second edition of its switchboard catalogue, in considerably enlarged form. Beginning with a single slab only big enough to hold a voltmeter, one switch, rheostat handle and ground detector, the catalogue goes by degrees through the whole line of single panels and then through multiple panels.

CATENARY LINE CONSTRUCTION.—The Westinghouse Electric & Manufacturing Company has issued a well-illustrated bulletin descriptive of its catenary line construction for high-tension trolley roads, operating at potentials up to 6,000 volts or higher. Each feature of the construction is treated in detail, and much valuable information is given concerning the material necessary for various equipments.

LIGHTING.—During the recent convention at Denver of the National Electric Light Association the Crocker-Wheeler Company, Ampere, N. J., distributed a pamphlet having the title, "The Vital Subject Is Lighting." The cover illustrates a Western cowboy on an obstreperous steed, the design having been suggested by the broncho-busting exhibition which was given in honor of the delegates to the convention.

A POPULAR WEDDING TRIP.—The D. & B. Steamboat Company, Detroit, Mich., has two new steamers on its line between Detroit and Buffalo. It mentions this as a delightful wedding trip. The new palatial steamers are named the *Eastern States* and the *Western States*. They run daily between the two cities named. Staterooms and parlors may be reserved in advance. Send two-cent stamp for illustrated booklet.

THE MACHINE TOOL AND THE MOTOR.—Under the above title the Northern Electrical Mfg. Company, Madison, Wis., is distributing a neat booklet, designated as No. 89, which illustrates various installations using Northern motors direct-connected to machine tools. A particularly interesting view is one showing a motor placed with its shaft in a vertical position on the top of a radial drill which it drives through appropriate gearing.

SELF-STARTING, SINGLE-PHASE MOTORS. — The Century Electric Company, 404 North Fourth St., St. Louis, has issued a leaflet calling attention to its self-starting single-phase motors, which are designed particularly for any service requiring automatic control or starting from a distance. These machines are self-contained, so that neither condensers, reactance coils or clutches are used with them, the only controlling device required being a double-pole knife switch.

CONTRACTORS' PORTABLE OUTFITS. — The Jeffrey Manufacturing Company, Columbus, Ohio, has recently issued a well-illustrated folder calling attention to equipments of especial interest to contractors. Detail information concerning these equipments can be obtained from the following catalogues: Rubber belt conveyors, No. 67A; elevating-conveying, No. 72A; screening, No. 69; locomotives, No. 19; self-dumping cars, No. 70A; mortar and concrete mixers, No. 65A.

THREAD MILLING MACHINE.—In a miniature folder contained within a souvenir mail card the Pratt & Whitney Company, 111 Broadway, New York, illustrates numerous samples of difficult work produced with its thread milling machines. With each illustration there are given the essential dimensions of the piece and the time needed for its production, so that one who so desires may determine the reduction in labor cost when using this machine as compared with other equipments.

WATER WHEEL GOVERNORS.—The Replogle Governor Works, Akron, Ohio, have issued a comprehensive catalogue of their new mechanical relay water wheel governor. In the design of these governors the use of hydraulic and electrical devices has been avoided, and it is stated that satisfactory performance of the devices has demonstrated that good speed regulation may be obtained without the use of pistons, pumps and valves. The catalogue serves to give a general idea of the capacity and characteristics of these governors.

P. & S. SOCKETS.—Pass & Seymour, Inc., Solvay, N. Y., have recently issued a price-list of standard 250-volt sockets, with copper contact shell. Five different styles of sockets are illustrated. The price-list covers lots of less than 100 up to 1,000 and over. On the back page is illustrated this firm's method of packing tubes and cleats for shipment. Neat pasteboard boxes are used, in which the tubes are closely and firmly packed. As pointed out, packing tubes in barrels exposes them to damage.

BIJUR STORAGE BATTERIES.—In catalogue A the General Storage Battery Company, 42 Broadway, New York, describes completely the type of storage battery developed by Mr. Joseph Bijur, which was described at some length in our columns recently. It is stated that the company has developed machinery which not only gives more advantageous form to the active material, but also permits the rapid automatic production of active parts in a form which heretofore could not be made at commercial cost. The battery is of the lead type, and one of its characteristic features is ability to withstand abuse.

CONDENSERS.—In catalogue No. 25 the W. H. Blake Steam Pump Company, Hyde Park, Mass., describes condensers of both the jet and the surface types. In the Blake jet condenser the injection water is so sprayed into the exhaust steam as to secure the most intimate mixture and produce instantaneous condensation, the water required being from 1 to 1.5 gallons per minute per horse-power. The surface condenser is designed along the lines of marine practice. The tubes are of Muntz metal, so held in the tube sheet as to allow for free expansion. Rapid condensation is secured by the introduction of baffle plates, which force the steam into close contact with the exterior of all pipes through which the water flows.

MOTORS FOR PRINTING ESTABLISHMENTS. — The Westinghouse Electric & Manufacturing Company is inviting attention to its system of speed control for motors operating flat-bed and cylinder presses. The variation in speed is obtained by change in the field strength of the motor. It is evident that this method is more economical than any which requires that resistance be inserted in the armature circuit. It is a fact worthy of note that one-third of the printers throughout the United States now use motors for driving their presses. To meet the demand for small motors suitable for operating stitchers, platen presses, electrotyping machinery and all auxiliary apparatus requiring small capacity motors, the company has developed a line of motors designated as Type R. Folder No. 4039 gives a short description of this line of motors, while circular No. 1099 describes them in detail.

MONARCH ENGINE STOP.—A recent publication of the Consolidated Engine Stop Company, 100 Broadway, New York, embodies a clever idea which, moreover, is excellently carried out. The object of the circular is to convey in an extract from a Rhode Island court decision denying damages for an injury, on the grounds that the defendant had his works equipped with a Monarch engine stop and speed-limit device, whereby the machinery which caused the injury was stopped within 6 or 8 seconds. The cover represents a law book carrying the title, "The Law of Employers' Liability." An extension at the top of the back cover appears to be part of the front cover, and consists of the bewigged head of a judge cut in contour. The mailing address is written on the back cover. The effect is such that one cannot resist seeking the object; and the reading matter is so brief that the glance once riveted will take it all in.

LIFTING MAGNETS.—The Electric Controller Supply Company, Cleveland, Ohio, has issued a bulletin covering the general subject of the use of lifting magnets for all classes of material. Included is a list of materials which may be handled to advantage by means of lifting magnets, divided into three classes. The first class covers pig metal, scrap of all kinds, and material, such as rivets, bolts, etc., which may be handled in bulk. Two sizes of magnets for this class of material are described, with illustrations showing the magnets as actually used in the stock yard of a large steel casting plant. Another shows a particularly novel use, namely, for "skull-cracker" work. Another type illustrated is for handling material having flat surfaces, such as plates, billets, ingots, slabs, etc. Sketches show the methods of wiring from a crane-cage to a magnet. This company has a large number of magnets in successful operation and has an extended experience with magnets for handling all classes of material. All magnets are given a thorough test of from three to six times the lifting capacity guaranteed on a special machine designed for this purpose.

## *News of the Trade.*

THE LIBBEY GLASS COMPANY, Toledo, Ohio, was recently represented in New York by Mr. C. G. Robb.

THE WESTERN ELECTRIC COMPANY, Chicago, reports a continuance of brisk trade in Sunbeam lamps, its sales of these lamps for this season of the year being unusually large.

THE C. H. WHEELER CONDENSER & PUMP COMPANY, Philadelphia, has opened an office in Chicago at 184 Washington Street. Mr. C. A. Street is the manager of the new office.

THE ELECTRIC CONTROLLER & SUPPLY COMPANY, Cleveland, will be represented by Mr. W. A. Ten Winkel, advertising manager, at the Manhattan Beach Convention of Master Mechanics, June 14 to 21.

MR. T. J. COPE, 3244 North 15th Street, Philadelphia, has recently returned from a trip through New England in the interest of conduit work, and his valuable line of conduit specialties which includes cable racks, conduit rods and other apparatus for installing wires and cables. The Cope methods and apparatus are now standard throughout the country.

PRESS PHOTOGRAPHS.—Mr. N. Lazarnick, one of the rising young press photographers of this country has been compelled by increasing volume of business to open offices in the Spalding Building, at 20 West Forty-second Street, New York. He was attached to Prince Henry, of Prussia, on his American trip, and has also travelled with Pres. Roosevelt and other celebrities.

THE STROMBERG-CARLSON TELEPHONE MFG. CO., Rochester, N. Y., reports having closed contracts for switchboards for the following places: Mt. Branch, Tenn.; Berwick, Pa.; Fulton, Kan.; Fenton, Iowa; Bowbells, N. D.; Folsomdale, Ky.; East Smithfield, Pa.; Elizabeth, N. C.; Washington, N. C.; Granville, N. D.; Pontiac, Ill.; Macon, Ill.; Chicago, Ill.; Fulton, Iowa.

THE F. BISSELL COMPANY, of Toledo, Ohio, will make an exhibit of several of its specialties at the independent telephone convention in Chicago next week, including its "Security" specialties for telephone construction. Its exhibit room on the same floor as the convention will also contain novelties in potheads and sleeves, with which interesting tests will be made for the benefit of all who are desirous of learning a cheap, quick and permanent way of making such appliances.

DOUBLEDAY-HILL ELECTRIC CO., Pittsburg, Pa., has put Mr. H. A. Kellogg in charge of its winding and repair department. He was formerly connected with the winding department of the Siemens-Halske and Westinghouse Electric winding departments. He has handled every kind of a job from fan-motor armature to an 1800-kw. armature. The company is also manufacturing special tablet boards, switchboards, wire connectors, armature and field coils, trolley wheels, experimental magnets, rheostats, etc.

THE CENTURY ELECTRIC COMPANY, St. Louis, Mo., finds that the popularity of its single-phase motors is steadily increasing. This is evidenced by the fact that during the month of May the sales of single-phase, self-starting motors exceeded the entire motor sales during the year of 1904. The motors are now built in sizes of ½ to 5 horse-power, 60 cycles, and are wound also for any other commercial frequency. The company also notes a very heavy increase in the demand for its alternating-current ceiling fans, the factory being taxed to the utmost to supply the demand at present.

# Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED JUNE 6, 1905.

[Conducted by Rosenbaum & Stockbridge, Patent Attys., 140 Nassau St., N. Y.]

791,464. ELECTRIC MOTOR CONTROLLING DEVICE; Arthur E. Handy, Providence, R. I. App. filed Sept. 19, 1904. A device to do away with low speed gearing for heavy loads in freight elevators. The motor has two separate armature circuits which can be connected up in different ways for different load conditions by a switch electrically controlled from within the car.

791,491. FACSIMILE TELEGRAPH APPARATUS; Herbert R. Palmer, Cleveland, O. App. filed Feb. 25, 1901. Relates to apparatus for transcribing pictures over a telegraph line, of the type in which a stylus traces over one of two synchronously rotating cylinders having the picture drawn thereon in insulating ink. The patent shows special synchronizing means and special arrangements for changing the circuits when the picture is completed.

791,492. DYNAMO-ELECTRIC MACHINE; Charles Algernon Parsons and George Gerald Stoney, Newcastle-Upon-Tyne, England. App. filed April 18, 1904. (See Current News and Notes.)

791,494. APPARATUS FOR MAGNETIC SEPARATION. Clarence Q. Payne, Stamford, Conn. App. filed Feb. 2, 1903. A magnetic ore separator in which a cylinder with myriad points thereon formed by iron laminations, each having saw-teeth on its periphery, is inductively magnetized. The magnetic ore clings to the cylinder for a longer period than the non-magnetic residue and is thereby separated.

791,528. SEWING-MACHINE MOTOR; Homer J. Young, Toledo, O. App. filed Feb. 20, 1904. The motor is so formed as to itself constitute the flywheel of the sewing machine and has a smooth peripheral surface like the usual hand wheel. The armature rotates round a stationary field.

791,536. DRIVING MECHANISM FOR CASH REGISTERS; Joseph P. Cleal, Dayton, O. App. filed Oct. 26, 1903. An electric motor has gear connections for driving the cash-register mechanism, and is thrown into action by a key. When it has been started into operation, a cam on the motor shaft insures the completion of the cycle of movement regardless of whether or not the key is kept depressed.

791,547. VAPOR ELECTRIC APPARATUS; Samuel Ferguson, Schenectady, N. Y. App. filed Jany. 18, 1904. (See Current News and Notes.)

791,562. ELECTRIC FLASH SIGN; John C. Lion, Philadelphia, Pa. App. filed Feb. 20, 1905. The contacts for the different lamp combinations are made by removable strips having fingers each dovetailed upon a revolvable drum. The contacts comprise spring clips in the individual lamp circuits. The construction is designed to light up any combination at the instant the preceding one is terminated.

791,572. BIPOLAR VACUUM ELECTRODE; Earle L. Ovington, Boston, Mass. App. filed Mar. 6, 1905. Comprises a vacuum tube elecfrode designed to be applied to the body. In order to avoid using the body as a conductor, the body is not made an electrode of the circuit, but the tube comprises two parts which constitute both electrodes.

791,573. AUDIPHONE INSTRUCTION APPARATUS OR SET; Herman G. Pape, New York, N. Y. App. filed Nov. 9, 1904. A telephone apparatus for the instruction of deaf pupils. The receivers for the very deaf pupils are in a primary circuit, while those for the other pupils are in a secondary circuit.

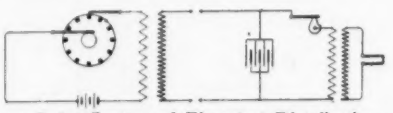
791,574. AUTOMATIC RAILROAD SIGNALLING; Frank P. J. Patenall and George H. Dryden, Baltimore, Md. App. filed Mar. 13, 1905. The operating mechanism for the signals is in duplicate and operable for the clear and caution positions, not only from the home station, but from the distant station as well, so that the apparatus will work in spite of the failure of either single operating mechanism.

791,582. AUTOMATIC STARTING DEVICE FOR VAPOR APPARATUS; Robert E. Russell, Schenectady, N. Y. App. filed Mar. 16, 1904. (See Current News and Notes.)

791,591. ELECTROMAGNET; August Sundh and David L. Lindquist, Yonkers, N. Y. App. filed Oct. 27, 1904. An alternating current electromagnet has a spring abutment for core to prevent chattering.

791,594. ELECTROMAGNETIC BLOCK SYSTEM; Guion Thompson, Two Harbors, Minn. App. filed May 16, 1901. From the car are suspended electromagnets which inductively energize other electromagnets upon the track. This completes a local circuit which continues the energization of the track magnets, until the circuit is broken by the train passing over a succeeding track magnet.

791,603. ELECTRICAL CONTACT DEVICE; Henri Beau, Paris, France, and Cipriano Portillo, Madrid, Spain. App. filed July 10, 1902. A device for tapping an electric lamp socket into the circuit of two parallel insulated conductors at any desired point. The sockets have needle points which are clamped so as to pierce the insulation of the respective wires.



791,856.—System of Electrical Distribution.

791,655.—TELEPHONE-CURRENT REINFORCER OR RELAY; Herbert E. Shreeve, Newton, Mass. App. filed July 8, 1904.

791,656. TELEPHONE-CURRENT REINFORCER OR RELAY; Herbert E. Shreeve, Newton, Mass. App. filed Feby. 28, 1905.

791,657. TLEPHONE-TRANSMITTER; Emil R. Snyder, New York, N. Y. App. filed March 21, 1904.

791,673. ELECTRIC METER; Frank P. Cox, Lynn, Mass. App. filed Mar. 2, 1903. The rotatable member is entirely submerged in mercury and is balanced therein by a heavy weight of metal, such as tungsten. The rotatable member forms one side of a resistance bridge containing resistance materials of such coefficients as to compensate for the heating effect of the disk.

791,691. ELECTRIC HEATER; William S. Hadway, Jr., East Orange, N. J. App. filed Aug. 4, 1903. The heater comprises a resistance plate composed of wrought sheet metal cut into a continuous strip and having its original grain undisturbed.

791,708. DINING TABLE OR COUNTER; Nicholas N. S. Matcovitch, Oakland, Cal. App. filed Aug. 3, 1904. A dining counter is provided with cavities for various articles of food and heating coils are incorporated therein to warm the same in cold weather.

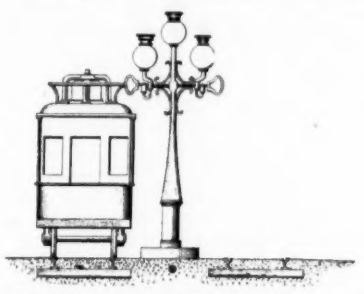
791,730. ELECTRICAL MOUTH BATH; Johan J. Stanger, Ulm, Germany. App. filed June 1, 1903. Medicine is taken through a tube which forms one electrode of a circuit, the other electrode comprising a massage roller adapted to be applied to any part of the body.

791,750. TROLLEY RETRIEVING DEVICE; Henry B. Clarke, Oak Park, Ill. App. filed Sept. 3, 1904. A pneumatic cylinder has connections for retrieving the trolley pole, the air valve being opened by an upward movement of the pole.

791,797. ELECTRIC SELF-WINDING CLOCK. Apollinarius Von Kaspis, Weehawken, N. J. App. filed June 23, 1904. Details of a motor-driven clock winder in which the main spring is rewound at comparatively short intervals of time.

791,816. CURRENT COLLECTING DEVICE FOR ELECTRIC CARS; Leon W. Pullen, Philadelphia, Pa. App. filed July 18, 1904. Relates to a trolley system in which conductors are arranged along the train to engage contact plates at periodic intervals. The conductors are magnetic so as to engage the contacts more firmly for heavy currents.

791,835. TROLLEY; Louis McD. Steele, Middletown, O. App. filed Nov. 12, 1904. The trolley harp has forwardly and rearwardly projecting arms thereon carrying spring-pressed swivel hooks which close over the trolley conductor. The hooks are swung to one side by the hangers, and can be thrown out altogether by connections from the car.



791,982.—System of Electrical Traction for Railways.

791,836. ELECTRIC TRAIN CONTROL SYSTEM; August Sundh and Axel Magnuson, New York, N. Y. App. filed Feb. 16, 1905. An inductive control system by which an alternating current multiple unit electric train may be controlled from one of the cars, through inductive connections which do not involve any electrical contacts.

791,856. SYSTEM OF ELECTRICAL DISTRIBUTION; Vincent G. Apple, Dayton, O. App. filed Feb. 18, 1904. An induction coil discharges into a condenser through a spark gap which accumulates a charge of considerable quantity. This charge is then led through the primary of a second induction coil which induces a discharge through the spark plug of the engine.

791,882. THERMOSTAT; John H. Cornelison, St. Louis, Mo. App. filed Feb. 15, 1905. A thermostat has two contacts which are spring-pressed toward one another. A strut of fusible metal normally holds the contacts separated, but permits the circuit to close in case of fire.

791,885. CONTROLLER FOR ELECTRIC MOTORS. Arthur C. Eastwood, Cleveland, O. App. filed Sept. 14, 1904. The controller has two arms, one swinging over the field resistance contacts and the other the armature circuit contacts and gearing is interposed so that the field resistance arm travels faster than the armature resistance arm.

791,886. CONTROLLER FOR ELECTRIC MOTORS; Arthur C. Eastwood, Cleveland, O. App. filed Sept. 16, 1904. Is designed for heavy currents and employs contactors for cutting out the resistance. The contactors are successively operated by a traveling magnet controlled from a plurality of points.

791,887. MOTOR CONTROLLING SYSTEM; Arthur C. Eastwood, Cleveland, O. App. filed Oct. 24, 1904. Relates to a system of contactors which can be operated when the motor is reversed, at only a predetermined speed which is fixed by the current which the motor is able to carry.

791,892. TELEPHONE-TRANSMITTER; Milton J. Fletcher, San Antonio, Texas. App. filed March 3, 1904.

791,929. POWER INSTALLATION; William Morrison, Chicago, Ill. App. filed Oct. 27, 1904. A gasolene driven generator for charging storage batteries has connections by which it may be initially operated as a motor to start the engine. The field is the normally rotating part, but in starting, the armature rotates and the torque is sufficient to impel the field magnets to start the engine.

791,938. SYSTEM OF ELECTRICAL DISTRIBUTION; Granville E. Palmer, Boson, Mass. App. filed July 5, 1904. A magnetic cut-out for constant current transformers which includes an overload magnetic release mechanism in the primary circuit, and an underload release mechanism in the secondary circuit.

791,961. BURGLAR ALARM SYSTEM; Joseph Weatherby, Jr., New Cumberland, Pa. App. filed Mar. 31, 1904. The apparatus to be protected is included in a circuit which forms one arm of a Wheatstone bridge arrangement. When the apparatus is disturbed by an authorized person, a signal is given and the central station operator inserts resistances which again balance the bridge and provide for further signals.

791,972. AUTOMATIC ELECTRIC SIGNALLING SYSTEM FOR RAILWAYS; David C. Wolfe, Lyons, Kan. App. filed Jan. 5, 1905. The railroad has two special conductors alongside the track for the signal devices. A shoe is normally in contact with one conductor for the reception of alarm signals, and another shoe may be engaged with the other conductor to signal the end stations when desired.

791,977. SNAP SWITCH; Walter A. Church, Binghamton, N. Y. App. filed June 17, 1903. The switch arm includes a spiral cam and is so arranged that it initially rides up the surface of a stop, and is then thrown suddenly to its contact position by a spring.

791,982. SYSTEM OF ELECTRICAL TRACTION FOR RAILWAYS; Maurice Leblanc, Paris, France. App. filed Aug. 29, 1901. A system to avoid unsightly trolley wires and expensive underground conduits. Contact plates at intervals along the track make circuits which cause a powerful high speed motor to store up energy in a fly wheel. The fly wheel is then connected to run the train between the contacts.

791,983. ELECTRICAL MOTOR-GENERATOR; Maurice Leblanc, Paris, France. App. filed Dec. 9, 1904. (See Current News and Notes.)

791,984. TRAIN CONTROLLING MECHANISM; Henry V. Miller, Chicago, Ill. App. filed Jan. 14, 1905. The train includes a polarized relay magnet which under proper conditions establishes circuits to operate whistle and air brakes momentarily. The operating condition arises when a train on an adjacent section operates a pole changer for local track circuit.